

**Landsat 7
Processing System (LPS)
Operations and Maintenance Manual**

Revision 1

July 21, 1997

**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**

Landsat 7
Processing System (LPS)
Operations and Maintenance Manual
Revision 1

July 23, 1997

Prepared by:

Danh Nguyen 7/24/97
Danh Nguyen Date
Engineering Specialist
Landsat 7 Processing System
cNMOS
Lockheed-Martin

Reviewed by:

Robert Schweiss July 24, 97
Robert Schweiss Date
Systems Engineering Manager
Landsat 7 Processing System
Code 514
Goddard Space Flight Center

Reviewed by:

Neil Ottenstein 7/25/97
Neil Ottenstein Date
Systems Engineer
Landsat 7 Processing System
cNMOS
Computer Sciences Corporation

Reviewed by:

Clifford K. Brambora 7/24/97
Clifford K. Brambora Date
Hardware Engineering Manager
Landsat 7 Processing System
Code 514
Goddard Space Flight Center

Concurred by:

Nathaniel E. Daniel 7/24/97
Nathaniel Daniel Date
Project Manager
Landsat 7 Processing System
cNMOS
Computer Sciences Corporation

Approved by:

Joy Henegar 7/25/97
Joy Henegar Date
Project Manager
Landsat 7 Processing System
Code 514
Goddard Space Flight Center

List of TBDs, TBRs, and TBSs

| Reference | Description | Page |
|----------------------|--|-------------|
| Section 1.5.13 (TBS) | General Standard Corp. HPDI/VSIO Board | 1-14 |
| Appendix H | HPDI/VSIO Spare Part | G-1 |

Preface

This manual contains operations and maintenance information for the Landsat 7 Processing System (LPS). This document will be continually updated to reflect the latest configuration of the LPS. Direct comments and questions regarding this document to

Landsat 7 Processing System Project
Code 514
Goddard Space Flight Center
Greenbelt, MD 20771

Table Of Contents

Section 1 — Introduction

| | | |
|-----|--|------|
| 1.1 | Purpose and Scope of Manual..... | 1-1 |
| 1.2 | Landsat 7 Processing System (LPS) Description..... | 1-1 |
| 1.3 | Equipment Supplied..... | 1-3 |
| 1.4 | Applicable Documents..... | 1-12 |
| 1.5 | Vendor Documents..... | 1-12 |

Section 2 — LPS Facility Related Information

| | | |
|-----|--------------------------|-----|
| 2.1 | Floor Space..... | 2-1 |
| 2.2 | Floor Loading..... | 2-1 |
| 2.3 | Power and Grounding..... | 2-1 |
| 2.4 | Heat Dissipation..... | 2-2 |
| 2.5 | Cabling..... | 2-3 |

Section 3 — Operation

| | | |
|-----|----------------------------|-----|
| 3.1 | LPS Startup..... | 3-1 |
| 3.2 | Login for IRISconsole..... | 3-2 |
| 3.3 | Logout..... | 3-3 |
| 3.4 | LPS Shutdown..... | 3-3 |

Section 4 — Software Installation and Hardware Configuration

| | | |
|-----|----------------------------|-----|
| 4.1 | Software Installation..... | 4-1 |
| 4.2 | Hardware Setup..... | 4-2 |

Section 5 — Hardware Description

| | | |
|-----|--------------------------------------|------|
| 5.1 | SGI Challenge XL..... | 5-1 |
| 5.2 | Challenge XL VME Bus..... | 5-8 |
| 5.3 | RAID/DLT Cabinet..... | 5-9 |
| 5.4 | Peripherals..... | 5-10 |
| 5.5 | Hardware Functional Description..... | 5-11 |

Section 6 — Maintenance

| | | |
|-----|-----------------------------|-----|
| 6.1 | Preventive Maintenance..... | 6-1 |
| 6.2 | Corrective Maintenance..... | 6-3 |

Appendix A—LPS Parts List

Appendix B—LPS Interconnection Cable List

Appendix C—LPS Interconnection Diagrams

Appendix D—LPS Host Name and IP Address

Appendix E—Recommended Tools and Equipments

Appendix F—Preventative Maintenance Schedule

Appendix G—Ciprico 34 GB RAID disk partition & xfs
file structure

Appendix H—Spare Parts List

Appendix I—SCSI IDs List

Appendix J—LPS Cable Parts List

Appendix K—LPS Software List

Acronyms List

Tables

2-1 ac Power Information for LPS Equipment.....2-2

Figures

1-1 LPS interfaces to Landsat 7 Ground System.....1-2
1-2 Operational Hardware Configuration.....1-5
1-3 Challenge XL (front view with doors open).....1-6

| | | |
|------|--|------|
| 1-4 | Challenge XL (rear view with doors open)..... | 1-7 |
| 1-5 | Challenge XL (rear view of cardcage)..... | 1-8 |
| 1-6 | RAID/DLT Cabinet (front view)..... | 1-9 |
| 1-7 | RAID/DLT Cabinet (rear view)..... | 1-10 |
| 5-1 | Challenge XL Architecture..... | 5-3 |
| 5-2 | IO4 Board #1..... | 5-4 |
| 5-3 | IO4 Board #2..... | 5-5 |
| 5-4 | FDDI connections..... | 5-6 |
| 5-5 | Indy, X-Terminal, Ethernet, and Console Line Diagram..... | 5-7 |
| 5-6 | Ethernet 10Based-T SuperHub (front view (a) and back view (b))..... | 5-8 |
| 5-7 | Data Capture Flow Diagram..... | 5-13 |
| 5-8 | Data Store Flow Diagram..... | 5-14 |
| 5-9 | Data Processing Flow Diagram..... | 5-15 |
| 5-10 | Data Transmit Flow Diagram..... | 5-16 |

Section 1 — Introduction

1.1 Purpose and Scope of Manual

This operations and maintenance (O&M) manual contains information for the hardware maintenance and basic operation of the Landsat 7 Processing System (LPS). Described in this manual are the physical and functional characteristics, site requirements, setup procedures, hardware description, maintenance procedures, parts lists, and schematic diagrams.

The operation section of this manual is limited to equipment startup and shutdown procedures including login and logout. These basic procedures are provided to facilitate maintenance activities and the system configuration procedures. The detail operation of the LPS data processing software is beyond the scope of this document. The complete details of the LPS data operation procedures can be found in the Landsat 7 Processing System User's Guide (Applicable Document 1.4.10). The information contained in this O&M manual is intended to provide a functional platform for the operational software.

Additionally, a detailed description of the LPS application software is contained in the Landsat 7 Processing System Detailed Design Specification and the Landsat 7 Processing System System Design Specifications (Applicable Document 1.4.7 and 1.4.9, respectively).

1.2 Landsat 7 Processing System Description

The LPS captures (receives and stores) Landsat 7 Enhanced Thematic Mapper Plus (ETM+) data from the Landsat 7 Ground System (LGS). These ETM+ data are transmitted to the LGS during a Landsat 7 contact. LPS receives the demodulated data from LGS in real-time. Once the raw ETM+ data have been processed by the LPS, they are transferred to the Earth Resources Observation Systems (EROS) Data Center (EDC) Distributed Active Archive Center (DAAC) for distribution to the end users. An interface and data flow context of LPS to Landsat 7 Ground Systems is shown in Figure 1-1. Additional information on the LPS and its interfaces to the other Landsat systems can be found in the reference documents listed in Section 1.4.

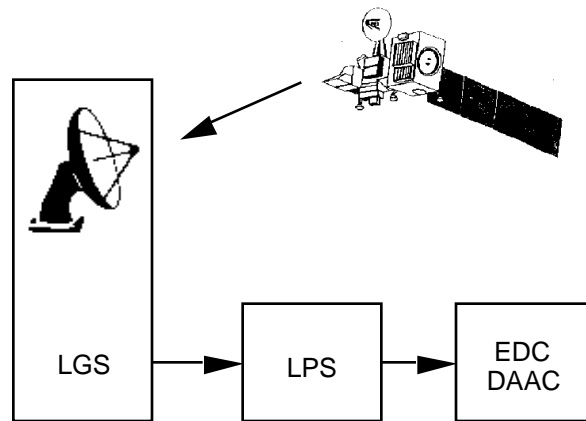


Figure 1-1. LPS interfaces to Landsat 7 Ground Systems

An operational hardware configuration of the LPS is shown in Figure 1-2. The LPS comprises five identical strings and associated peripherals. During normal operations, the LPS strings receive serial ECL NRZ-L data and clock from the LGS Matrix Switch at the wideband data rate of 75 Mbits/sec. A maximum of any four of the five strings can receive data during a contact. The fifth string is used as a backup and to support system test and development. Additionally, the LPS strings can transmit data back to the switch for test purposes.

During a Landsat 7 contact, the LPS strings temporarily store the received ETM+ raw data on a redundant array of independent drives (RAID) located in the RAID/DLT cabinet. This RAID is designated the "capture RAID." Once the contact is complete, Level 0R (LOR) data processing is performed on the ETM+ data. The LOR output files are stored on a second RAID, also located in the RAID/DLT cabinet, for subsequent transfer to the EDC DAAC. This RAID is designated the "transfer RAID." Each RAID can store 34 GBytes of data.

The controller for each string is a Silicon Graphics, Inc. (SGI), Challenge XL Network Resource Server. The Challenge XL performs the data processing tasks. Included with the Challenge XL are a 4mm digital audio tape (DAT) drive, a 8mm tape drive, a compact disk read only memory (CD-ROM) drive, and a 4.3 GBytes system disk (note that string 5 has two 4.3 GBytes system disks).

The RAID/DLT cabinet contains a Box Hill MDL1C-7-DLT4 Media Changer Library for short-term data archiving. During LOR processing, the raw ETM+ data are transferred from the capture RAID to the Box Hill MDL1C-7-DLT4 Media Changer for 30-day archive.

Two X terminals, three Indy workstations and one IRISconsole provide operator interface. Two of the Indy workstations are used to display compressed images of the ETM+ sensor data during LOR processing. These two Indys provide four windows (two windows per Indy) for displaying images from four LPS strings. The image displayed on the window is referred to call as a "moving window display." A LANCAST Ethernet 10Base-T SuperHub provides the network interface between the LPS local area network (LAN) to the EDC LAN. Five label printers are provided (one for each LPS string) to generate the MDL1C-7-DLT4 cassette labels. Two laser printers are used for report generation.

1.3 Equipment Supplied

Each LPS string contains an SGI Challenge XL network resource server, Model CMN A010. Figure 1-3 shows the front view of the Challenge XL.

The Challenge XL storage devices include the following:

- A. 4.3 GB system disk (string 5 has two 4.3 GB system disks)
- B. CD ROM
- C. 4mm DAT drive
- D. 8mm tape drive

Figure 1-4 depicts the rear view of the Challenge XL showing connector locations.

Figure 1-5 shows the rear view of the cardcage. The SGI portion of the cardcage contains the following:

- A. Four RAM boards (128 MBytes per board, 512 MBytes per XL)
- B. Two CPU boards (each CPU board contains four 250 Mhz R4400 processors, for a total of eight processors per XL)
- C. Input/Output (IO4) board #1 (includes VMEbus channel adapter module (VCAM) board for VME bus interface).
- D. Input/Output (IO4) board #2 (has additional SCSI-2 mezzanine board and FDDI mezzanine board)

Each SGI Challenge XL has an internal VME backplane. A VCAM board provides the interface between the SGI backplane and the VME backplane. The VME chassis of each Challenge XL has a General Standards Corporation HPDI/VSIO board, which is used to convert the high-speed serial data stream to parallel data. More details of the HPDI/VSIO board can be found in Section 5 of this O&M manual.

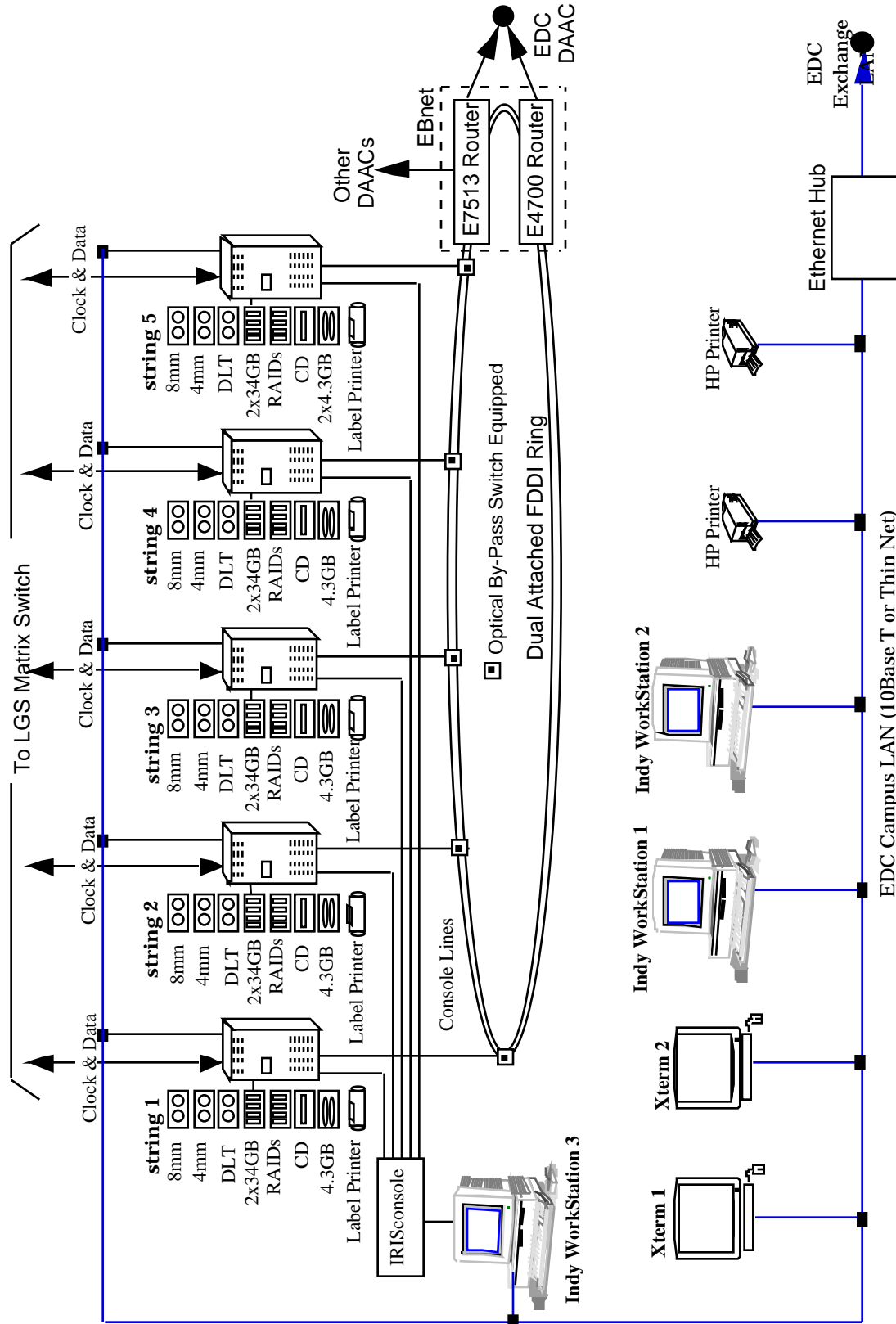


Figure 1-2. Operational Hardware Configuration

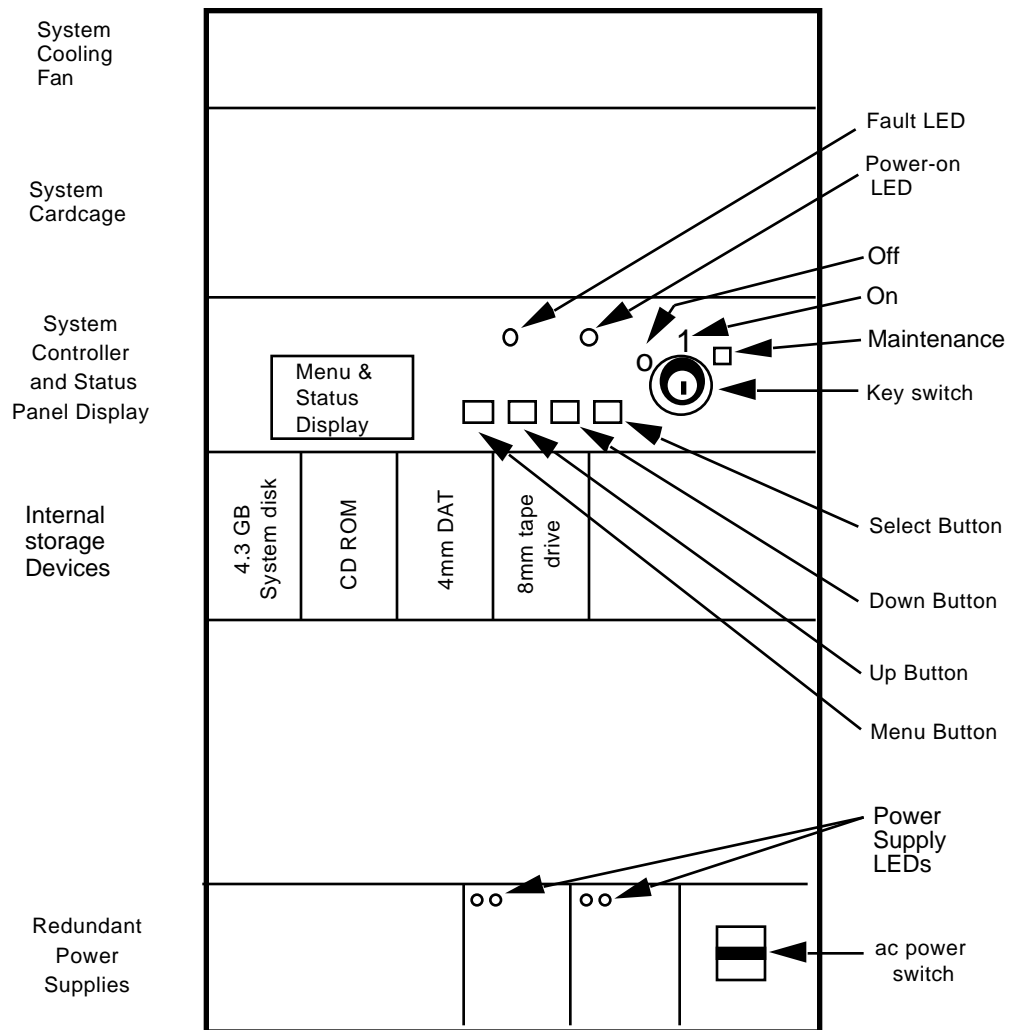


Figure 1-3. Challenge XL (front view with doors open)

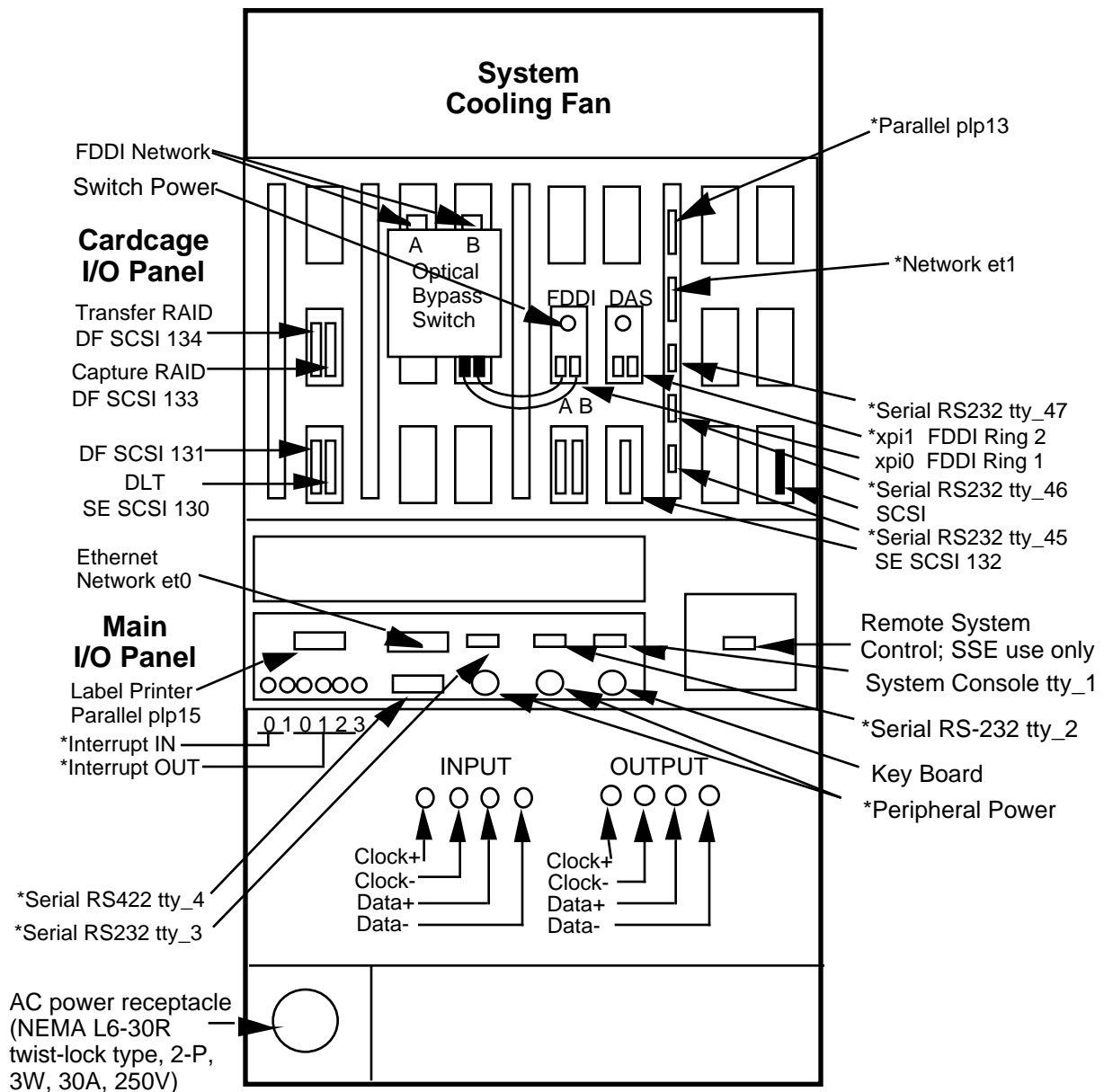


Figure 1-4. Challenge XL (rear view with doors open)

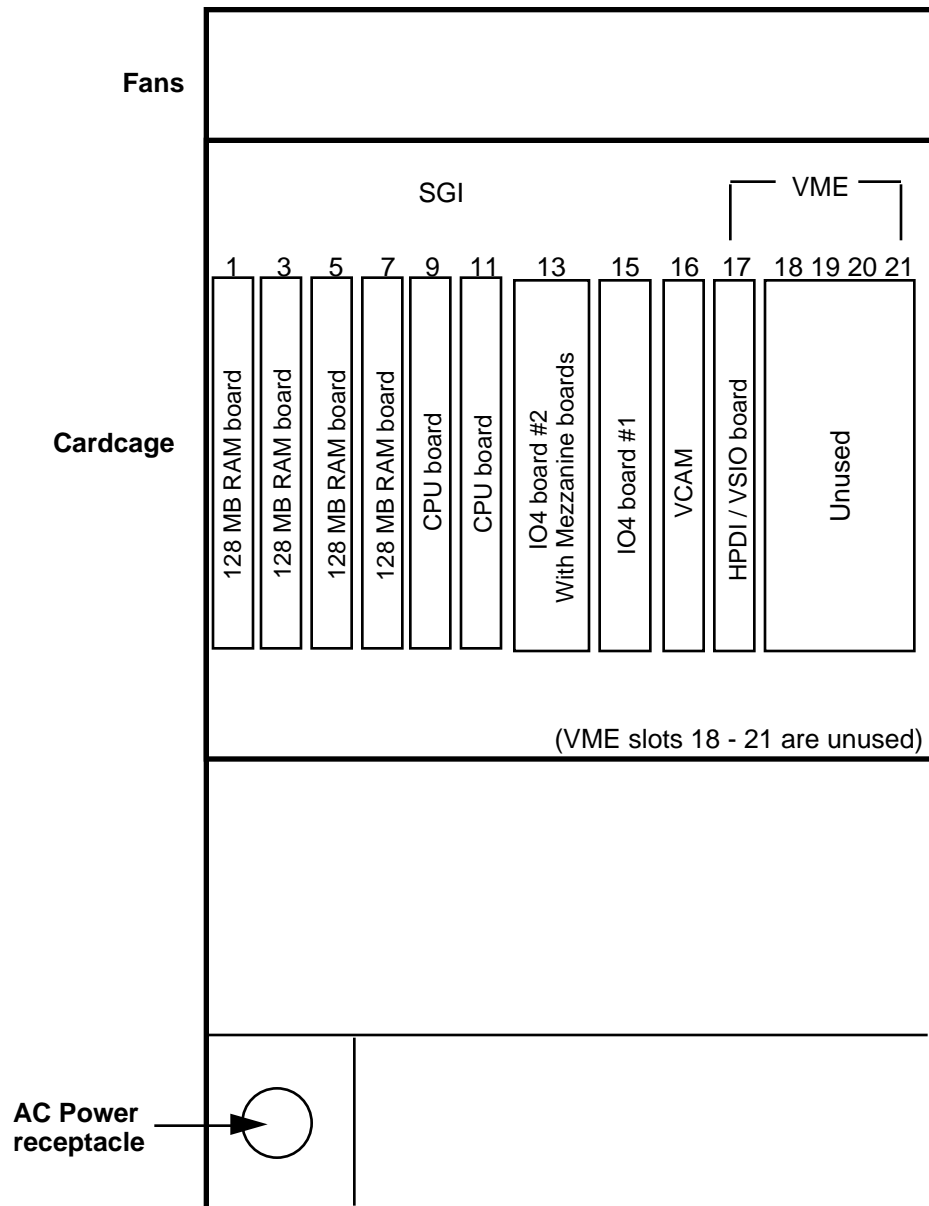


Figure 1-5. Challenge XL (rear view of cardcage)

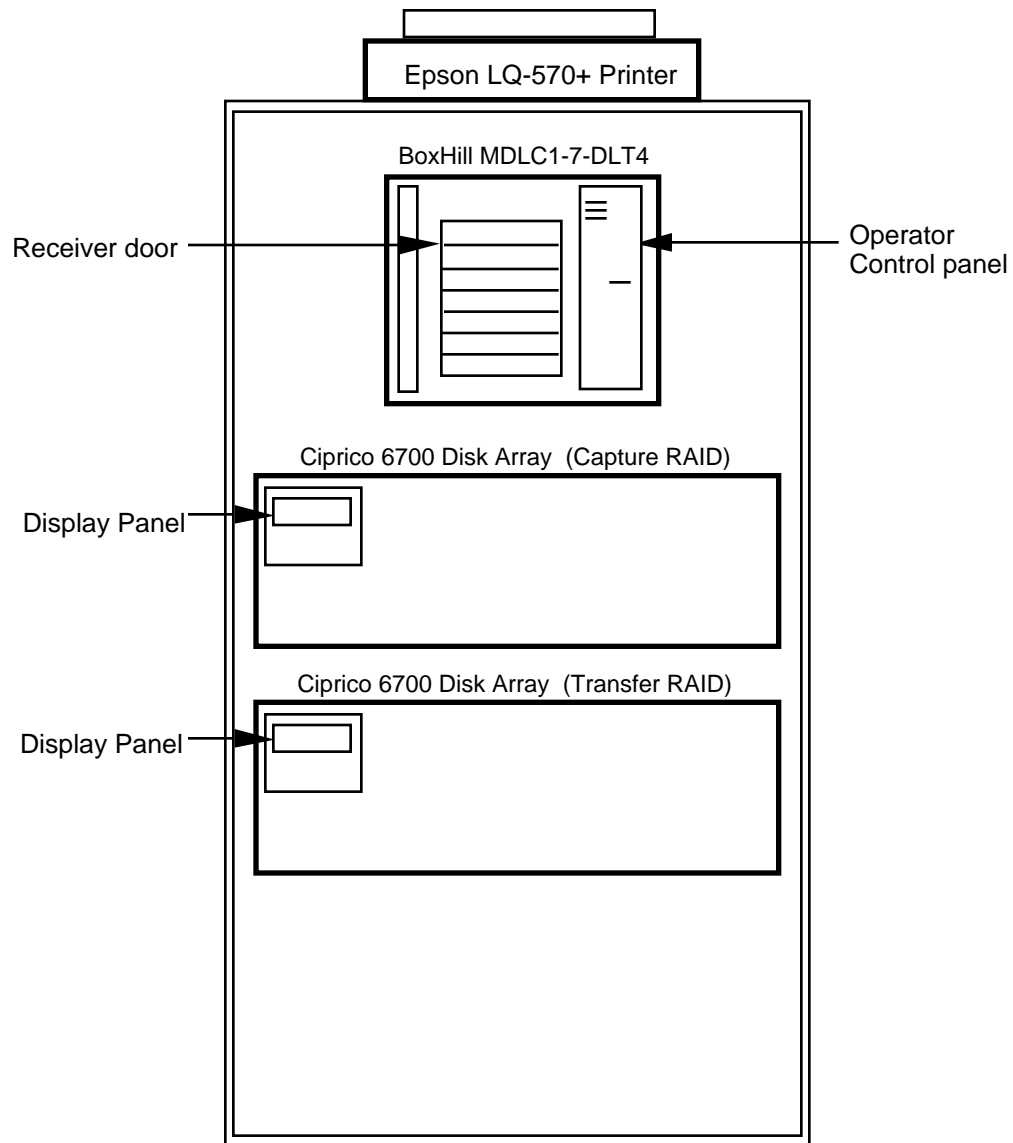


Figure 1-6. RAID/DLT Cabinet (front view)

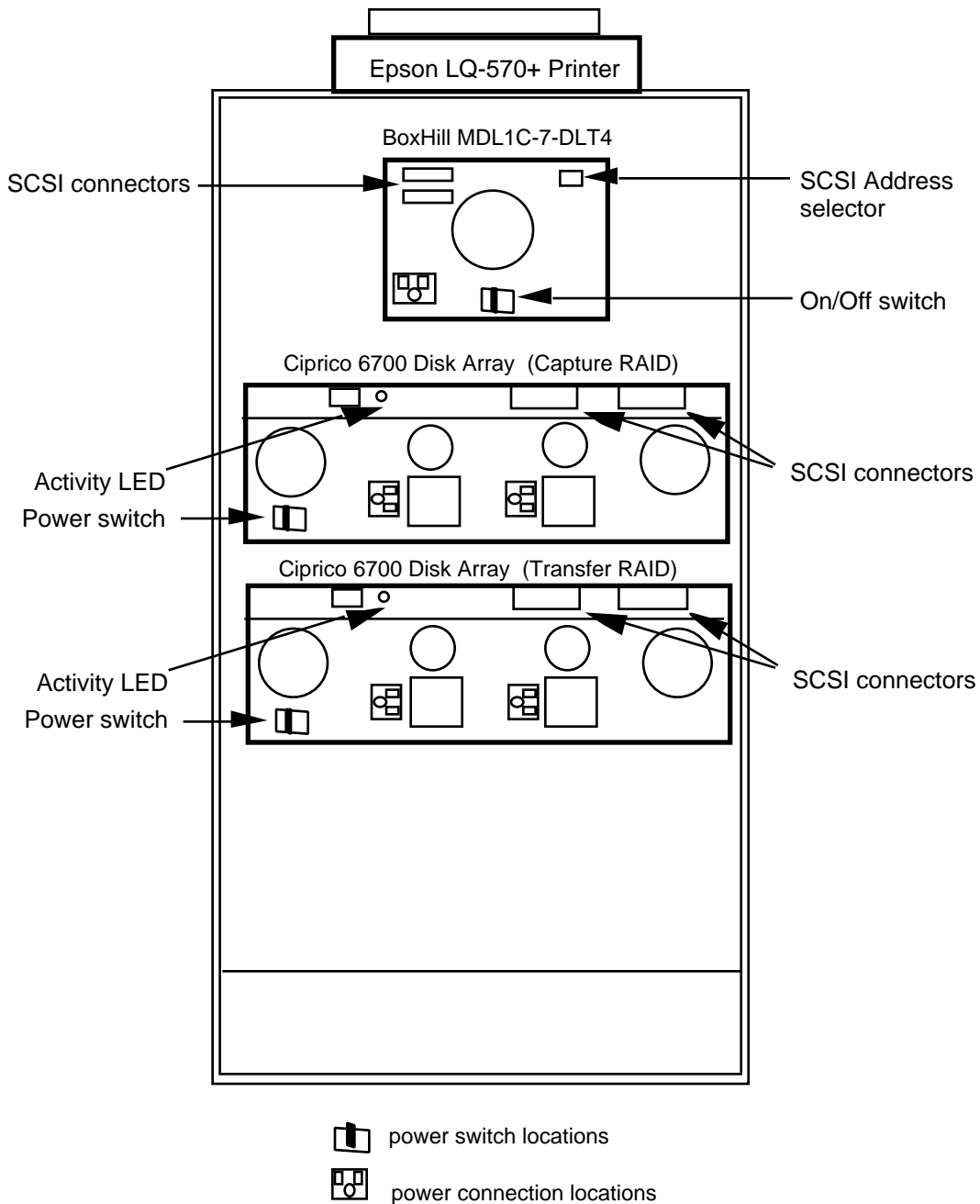


Figure 1-7. RAID/DLT Cabinet (rear view)

A RAID/DLT cabinet is included with each LPS string. Figures 1-6 and 1-7 show the front and rear view of the RAID/DLT cabinet. Each RAID/DLT cabinet contains the following:

- A. Two Ciprico, Inc., 6700 disk arrays, Model AR 6702

B. Box Hill MDL1C-7- DLT4 Media Changer

Each LPS string has an Epson letter-quality printer model LQ-570+ The other LPS peripherals are

1. Three Silicon Graphics Incorporated INDY R4600PC workstations
2. Two Network Computing Devices Incorporated X-Terminals (X-terms) consisting of the following:
 - A. 21-inch color monitor NC2185AA
 - B. HMX system base unit
3. Two HP LaserJet 5 printers
4. One SGI IRISconsole
5. One LANCAST Ethernet 10Base-T SuperHub 4422

1.4 Applicable Documents

1. EROS Data Center, DHF-MAN-002, EDC Site Preparation Plan for the Installation of the Landsat 7 LGS. LPS, and IAS, June 26, 1996.
2. NASA/GSFC, 514-2TP/0195, LPS Transition Plan, October 7, 1996
3. —, 514-4BIP/0195, LPS Build Implementation Plan, September 1996
4. —, 540-097, Interface Control Document Between the EBnet and the Landsat 7 Processing System (LPS), July 1996
5. —, 209-CD-013-004, Interface Control Document Between EOSDIS Core System (ECS) and the Landsat 7 System, August 1996
- 6.—, 560-1ICD/0794, Interface Control Document between the Landsat Ground Station and the Landsat Processing System, Revision 1, October 17, 1996
7. —, 514-4DDS/0195, Landsat 7 Processing System (LPS) Detailed Design Specification, November 1995
8. —, 514-2IP/0195, Landsat 7 Processing System (LPS) Installation Procedure, Signature, October 14, 1996
9. —, 4560-8SDS/0194, Landsat 7 Processing System (LPS) System Design Specifications, May 26, 1995
10. —, 514-3SUG/01, Landsat 7 Processing System User's Guide, March 1997

1.5 Vendor Documents

1. Network Computing Devices Inc., Part No. 9300289, About Your 21-Inch Color Monitor NC2185AA, Revision A, April 1994
2. —, Part No. 9300326, Installing Your HMX Family System, Revision A, February 1995

3. Ciprico Inc., Publication No. 21020270A, AD6700 Integrated Disk Array Quick Installation Guide, August 1993
4. —, Publication No. 21020650A, AD6700/10 Disk Array Guide and Addendum, March 1994
5. —, Publication No. 21020295 H, Product Note for 6700/10 Disk Arrays and Controller Boards, April 1995
6. Silicon Graphics Incorporated, Document No. 108-7040-020, Challenge/Onyx Site Preparation Guide, 1993
7. —, Document No. 007-9804-050, Indy Workstation Owner's Guide, February 1996
8. —, Document No. 007-1735-040, Power Challenge™ and Challenge XL Rackmount Owner's Guide, February 1996
9. —, Document No. 007-2872-001, IRISconsole Administrator's Guide
10. Box Hill Systems Corporation, Document No. note-94-006, Using the Box Hill MDL1C-7 Media Changer Nov. 1st 1995
11. Hewlett-Packard, Publication No. C3916-90901, LaserJet 5 and 5M Printer User's Manual
12. —, Publication No. C3916-90919, LaserJet 5 Printer Getting Started Guide, First Edition, April 1996
13. IRIS Insight Library, "Decksides Power Challenge and Challenge L Owner's Guide" (This online documentation is available on the SGI Challenge L system drive.)
14. General Standard Corporation, High Speed Parallel Digital Interface (HPDI)/Very High Speed Serial Interface (VSIO) Board User's Manual (TBS)
15. Epson America, Inc., X-LQ570PLUS, Epson LQ-570+ (Label) Printer User's Guide
16. LANCAST Standard Hierarchical Networks, Ethernet 10Base-T SuperHub 4422 User's Manual;

Section 2 — LPS Facility Related Information

This section provides information on floor space, floor loading, power and grounding, heat dissipation, and cabling for the LPS installed at the EDC site. Detailed requirements and design specifications for preparing the LPS installation site are provided in EDC Site Preparation Plan for the Installation of the Landsat 7 LGS, LPS, and IAS (Applicable Document 1.4.1).

A detailed list of the LPS hardware components installed at the EDC is provided in Section 5.

2.1 Floor Space

The EDC site floor plan and the computer room layout for LPS is shown in the EDC Site Preparation Plan for the Installation of the Landsat 7 LGS, LPS, and IAS (Applicable Document 1.4.1).

SGI specifies a minimum ceiling height of 96 inches to allow for Challenge XL cabinet airflow clearance. Also the Challenge XL cabinet requires 36 inches front and back to allow the doors to open fully. For activities that utilize side access, adequate space is required to roll the cabinet forward or backward to provide side clearance.

2.2 Floor Loading

For installation on raised floors, minimum floor loading is 133 pounds per square foot to support the SGI Challenge XL. The SGI Challenge cabinets use four casters and four stabilizing levelers for weight distribution. If the floor is modified (for example, by adding cutouts for cable access), the EDC has provided the additional reinforcement, as required.

2.3 Power and Grounding

Table 2-1 summarizes the alternating current (ac) power information for the LPS equipment.

Table 2-1. Alternating Current Power Information for LPS Equipment

| Equipment | Power VAC (min/nom/max) | Hertz (min/max) | Phase | Amps | Connector Type |
|---|--|--------------------|--------|------------|--|
| Challenge XL | 187/208/264 | 50/60 | 1 | 24 | NEMA L6-30R) twist-lock type, 2- P, 3-W, 30A, 250V) |
| RAID/DLT cabinet | 100/120 | 50/60 | 1 | 14 | NEMA 5-15P (100/120V @ 15 Amps) |
| Indy workstation - System chassis - Monitor | 100/132 100/132 | 47/63 47/63 | 1 1 | 4.2 2.7 | NEMA 5-15P |
| NCD X-Terminal - Terminal base - Monitor | 90/264 (use 110 nominal) 90/264 (use 110 nominal) | 47/63 50/60 | 1 1 | 0.2 1.3 | NEMA 5-15P |
| Hewlett-Packard LaserJet5 printer | 100/127(+/-10%) | 50/60 | 1 | 11.2 | NEMA 5-15P |
| Epson LQ 570+ printer | 120 | 50/60 | 1 | 2 | NEMA 5-15P |
| IRISconsole | 110 | 50/60 | 1 | 1 | NEMA 5-15P |
| 24 ports Ethernet 10Base- T SuperHub 4422 | 110 | 50/60 | 1 | 0.5 | NEMA 5-15P |

The LPS equipment/racks are grounded as specified in EDC Site Preparation Plan for the Installation of the Landsat 7 LGS, LPS, and IAS (Applicable Document 1.4.1). There are no special grounding requirements for the LPS equipment.

2.4 Heat Dissipation

The heat dissipation information on LPS equipment is as follows:

| Equipment | No. of Units | ac Load (ton) (each unit/system) | Btu/Hour (each unit/system) |
|-----------------------------------|-----------------|-------------------------------------|--------------------------------|
| Challenge XL | 5 | 1.33 | 16,000 |
| Indy | 3 | 0.075 | 900 |
| Box Hill MDL1C-7- DLT4 | 5 | 0.028 | 340 |
| RAID | 10 | 0.085 | 1,020 |
| X-Terminal | 2 | 0.048 | 570 |
| Printers | 2 | 0.090 | 1080 |
| LPS Totals (All Units) | | 8.141 | 97,900 |

The total of 97,900 Btu per hour is required for the LPS, this total is based on five Challenge XL cabinets, three Indy workstations, five RAID/DLT cabinets, and two X terminals.

NOTE: The Challenge cabinet airflow is drawn in through the bottom and blown out through the top. The RAID/DLT cabinet pulls in air from the front and exhausts out the back. The Challenge cabinets and RAID/DLT cabinets are positioned above vented floor tiles.

2.5 Cabling

The cable listing and the interconnection diagrams for the LPS are provided in the Appendices B and C, respectively. The LPS cables including the Indy console cables, printer cables, network (ethernet and FDDI) cables, cables between Challenge XLs and RAID/DLT Cabinets, and coaxial cables between Challenge XLs and LGS matrix switch (5 clock and data per string) are identified by a cable number that cross references to a cable drawing.

Section 3— Operation

This section describes the basic operation of the LPS equipment including startup, login, logout, and shutdown. These procedures are provided to support maintenance activities and the equipment configuration (Section 4). The complete LPS data operations procedures are contained in the Landsat 7 Processing System User's Guide (Applicable Document 1.4.10).

3.1 LPS Startup

Apply power to the following LPS equipment:

- Five SGI Challenge XL cabinets—Turn on power at the switch located behind the lower front door (Figure 1-3) (note that, RAID/DLT peripherals should be on prior to powering on the challenge XLs). Verify that both power supplies have the left amber (ac good) light emitting diodes (LEDs) lit. Insert the key into the lock on the front panel and turn clockwise to 12:00 (ON) position. Verify that the fans start and the front display becomes active and the right green (dc good) LEDs on both power supplies are lit. The system will boot automatically. The XL green power-on LED, located above the function buttons, lights up to indicate that power has been applied to the system midplane. The amber fault LED then lights up to indicate that power has been applied to the system controller. The fault LED goes out when the system controller has successfully initialized and the power-on self-tests (POSTs) are completed.
- Two NCD X-Terminals—Refer to manufacturer's documentation. The monitor power switch is located on the back of the monitor. Verify that the power indicator is green. The power switch for the terminal base unit is located on the rear of the unit. Verify that the power LED is illuminated.
- One SGI IRISconsole—Refer to manufacturer's documentation (Section 1.5.9). Plug power cord to the IRISconsole and the electrical outlet. IRISconsole should be powered on prior to powering up the Indy which the console is connected to.
- Three SGI Indy workstations—Refer to manufacturer's documentation. Turn on the monitor power switch on the front of the monitor. Verify that the power indicator is illuminated. On the system chassis, press and release the power switch on the front panel. The power indicator is

amber for a few seconds as the system runs the power on diagnostics. The LED turns green as the system boots.

- Five RAID/DLT cabinets (Figures 1-6 and 1-7)—Refer to manufacturer's documentation (Section 1.5). The power switches of the Box Hill MDL1C-7- DLT4 Media Changers and RAIDs are located on the rear of the unit.

When the Box Hill MDL1C-7- DLT4 Media Changers are powered on, each unit goes through its POST. All of the LEDs on the front of the drive enclosure turn on sequentially from top to bottom as the POST begins. All four LEDs stay on solidly as the POST runs. All LEDs except the yellow tape-in-use LED go dark as the POST finishes. Apply power to the Box Hill MDL1C-7- DLT4 Media Changers and verify the POST.

At RAID power up, each RAID performs a built-in self-test (BIST). This process takes approximately 10 seconds. At the conclusion of the process, the display should indicate "On Line Status: OK." Apply power to the RAIDs and verify the BIST.

- Five Epson LQ-570+ (label) printers—Refer to manufacturer's documentation (Section 1.5.14). Press and release the power switches on the front of the Epson LQ-570+ label printers and verify that the power indicator of each printer is lit.
- Two Hewlett-Packard (HP) LaserJet 5 printers—Refer to manufacturer's documentation (Section 1.5.11). Turn on the power switch on the front of each unit to "I" position. Verify that after the printer warms up, the display reads "READY."
- One 24 ports LANCAST Ethernet 10Base-T SuperHub 4422—Refer to manufacturer's documentation (Section 1.5.15). Plug power cord to the Ethernet Hub and the electrical outlet.

3.2 Login for IRISconsole

After the power up of each Indy, a login window appears. At the prompt, enter name and password on each Indy.

At Indy 3, establish a console window for each LPS string by using the following steps from the IRISconsole utility:

1. Click on the IRISconsole icon on the desktop
2. Open the Icon Catalog icon from the Overview window.

3. Select the application from the Catalog window.
4. Select the IRISconsole icon on the Icon Catalog Application window.
5. Select an icon that represents string 1 on the IRISconsole window.
6. Select the "Get Console" button on the IRISconsole site window.
7. Enter the system console login ID and password.
8. Apply the selections.

After startup and selection are finished, the prompt "lps001 (or 002 through 005) login:" will appear on each Indy window. Type in the login and password. At the message "TERM=(vt100)" press <ENTER>.

This completes the login sequence.

3.3 Logout

At each of the Indy workstations, logout can be done by the following steps:

1. Quit from applications
2. Logout from the Challenge XLs by typing "exit" <CR>.
3. Logout from each Indy by choosing "logout" from the Window Manager menu.

This completes the logout sequence.

3.4 LPS Shutdown

To shut down the LPS, perform the following procedure.

1. Five Challenge XL cabinets—At each Indy workstation, log out from all five Challenge XLs. Using the IRISconsole bring up a console window for the desired Challenge XL, log in as root, type "shutdown" and wait for "System Maintenance

Menu" to appear then turn the Challenge XL key switch to OFF position.

2. Five Epson LQ-570+ (label) printers—Turn off the power switch on the front of each unit to be powered down.
3. Two HP LaserJet 5 printers—Turn off the power switch on the front of each unit to be powered down.
4. Five RAID/DLT cabinets—Turn off each RAID and Box Hill MDL1C-7- DLT4 Media Changer within the cabinet. The power switches of the Box Hill MDL1C-7- DLT4 Media Changers and RAIDs are located on the rear of each unit.
5. Two NCD X-Terminals—Logout and turn off the monitor power switch located on the back of the monitor. Turn off the power switch for the terminal base unit located on the rear of the unit.
6. Three SGI Indy workstations—Turn off the power switch on the front of the monitor. Turn off the system chassis on the front panel.
7. Five Challenge XL cabinets—Turn off the power switch on the lower right front of the Challenge XL chassis.
8. One IRISconsole—Unplug power cord from the electrical outlet.
9. One Ethernet 10Base-T SuperHub—Turn off the power switch on the back of the SuperHub 4422.

This completes the power-down sequence.

Section 4

Software Installation and Hardware Configuration

This section contains information regarding commercial-off-the-shelf (COTS) software installation and the LPS hardware setup. Once these procedures have been implemented, the LPS is functional for data operations. After LPS operation has started, follow software procedures provided in the LPS Programmer Reference Guide and LPS User's Guide. Refer to Appendix K for more information on the LPS software.

4.1 Software Installation

4.1.1 Challenge XL Operating System

The LPS operational software is installed on each Challenge XL system drive prior to shipment to the EDC. Therefore, LPS operational software installation is not required at the EDC site. However, if for some reason the software is found to be corrupted during LPS installation, the backup (restore) tape can be used to reinstall LPS operational software. The backup/restore tape of the LPS operational software is contained on cartridges of the Box Hill MDL1C-7- DLT4 Media Changer.

EDC operation and maintenance personnel are responsible for future IRIX operating system upgrade.

4.1.2 Oracle Data Base Management Software

The Oracle 7TM data base management software is installed on each Challenge XL system prior to shipment to the EDC. Therefore, the Oracle 7TM software installation is not required at the EDC site. If for some reason the software is found to be corrupted during LPS installation, the backup tape can be used

to reinstall the Oracle 7™ software. Refer to the Oracle 7™ Installation and Configuration Guide.

4.1.3 Hierarchical Data Format (HDF) Library

The current version of hierarchical data format (HDF) software is installed on each Challenge XL system prior to shipment to the EDC. Therefore, the HDF software installation is not required at the EDC site. If for some reason the software is found to be corrupted during LPS installation, the instruction to install and the current version of HDF software can be found via the internet site of the National Center for Supercomputing Applications (NCSA). Using the file transfer protocol (FTP) to download the software files from the NCSA FTP site: ncsa.uiuc.edu.

4.1.4 LPS Level OR Processing Software

The LPS Level OR software is installed on each Challenge XL system prior to shipment to the EDC. If for some reason the software is found to be corrupted during LPS installation, the backup tape can be used to reinstall the LPS Level OR software. Refer to the LPS Software Configuration Guide for more details.

4.1.5 Indy Workstation Software

The Operating System and network boot up software are installed on each Indy workstation prior to shipment to the EDC. Therefore, software installation for the Indy workstation is not required. The system and software are covered under the SGI maintenance contract.

4.2 Hardware Setup

4.2.1SGI Challenge XL

SGI is contracted to install and setup the Challenge XLs. Refer to Appendixes B and C for more information on the Challenge XL's external cable connections.

4.2.2Indy Workstation

Refer to Chapter 2 of the Indy™ Workstation Owner's Guide (Vendor Documents 1.5.7) for creating a login account and a network connection. After LPS installation, all host names and IP addresses of systems are documented in Appendix D of this O&M manual.

After the power up of each Indy workstation, a login window appears. At the prompt, enter the name and password on each Indy.

4.2.3X Terminal

There is no special hardware setup procedure is required for X Terminal at EDC site. However, the details information on basic installation, selecting screen resolution, installing optional hardware, and network interface connection can be found in the following reference documents:

About Your 21-Inch Color Monitor NC2185AA (Vendor Documents 1.5.1)

Installing Your HMX Family System (Vendor Documents 1.5.2)

4.2.4Box Hill MDL1C-7- DLT4 Media Changer

The small computer system interface (SCSI) ID of all Box Hill MDL1C-7- DLT4 Media Changers are set to 5 prior to shipment to the EDC. Refer to Using the Box Hill MDL1C-7- DLT4 Media Changer (Vendor Document 1.5.10) for setting the SCSI ID.

4.2.5Ciprico Disk Array

The SCSI ID of all Capture RAID's are set to 2 and the SCSI ID of all Transfer RAID's are set to 4 prior to shipment to the EDC. Refer to Chapter 2, Section 8 "Configuring the Array," of the 6700/10 Disk Array Guide (Vendor Document 1.5.4) for setting the SCSI ID. Refer to appendix G of this O&M manual for more information on disk partition and xfs file structure of Ciprico 34 GB RAID.

4.2.6IRISconsole

The SCSI ID of IRISconsole unit is set to 5. Refer to Chapter 2, "Configuring Sites", of the IRISconsole Administrator's Guide (Vendor Document 1.5.9) for setting the SCSI ID. The IRISconsole unit is controlled by the Indy workstation No. 3, therefore, the IRISconsole unit should be located next to this workstation.

4.2.7HP LaserJet 5 Printer

Refer to HP LaserJet 5 Printer Getting Started Guide, (Vendor Document 1.5.12) for setting up the printer and connecting to the Ethernet network..

4.2.8EPSON LQ-570PLUS Printer

Refer to the Epson LQ-570+ User's Guide (Vendor Document 1.5.15). Chapter 1 "Setting Up the Printer" for information on connecting, configuring and testing the printer.

4.2.9LANCAST Ethernet 10Base-T SuperHub

Hardware setup is not required for the Ethernet 10Base-T SuperHub. Refer to Appendixes A1 and C2 for information on connecting the Ethernet 10Base-T SuperHub to the other systems and to the EDC network. The Ethernet 10Base-T SuperHub is located in the communication cabinet.

4.2.10 Network Configuration

1. Setting the Ethernet LAN IP addresses.

The Ethernet IP addresses are obtained from the EDC network administrator (refer to Table 1-1 "LPS Installation Responsibilities Matrix" of the Landsat 7 Processing System Installation Procedure (Applicable Document 1.4.8)).

2. Setting the FDDI LAN addresses.

The FDDI IP addresses are obtained from the EBnet network administrator (refer to Table 1-1 "LPS Installation Responsibilities Matrix" of the Landsat 7 Processing System Installation Procedure (Applicable Document 1.4.8)).

Section 5 — Hardware Description

This section describes the LPS hardware components and provides the detailed functional description of the LPS components. The LPS hardware configuration is shown in Figure 1-3.

5.1 SGI Challenge XL

The SGI Challenge XL servers are multi-processor systems designed for distributed computing environments. See Figure 5-1. Their parallel architecture is based on a 1.2 GBytes per second sustained bus (E-bus). Each LPS Challenge XL supports eight 250 Mhz R4400 CPUs which are installed on two redundant CPU boards. There are four CPUs on each CPU board. Each CPU has 4 MBytes of secondary cache. The memory subsystem has four RAM boards providing 512 MBytes of memory with four-way interleaving.

As depicted in Figure 5-1, the two IO4 boards and associated mezzanine boards contain the interface for the SGI storage devices, and the RAID/DLT cabinet. The SGI storage devices include a CD-ROM, a 4mm DAT, a 8mm tape, and a 4.3 GBytes system disk.

The IO4 board #2 has two mezzanine boards mounted to it with additional controllers to interface to the RAID/DLT cabinet and FDDI network. Additional to the SGI storage devices controllers, the IO4 board #1 also has the controller for the VME/64 backplane, which is internal to the Challenge XL cabinet. The Ethernet LAN controller, along with serial and parallel ports is also located on these IO4 boards.

Figure 5-2 shows the architecture of IO4 board #1. The I-bus connects the various controllers to the E-bus. A single-ended SCSI controller is daisy-chained to the CD-ROM, DAT, and 8mm tape. The 4.3 GB system disk is connected to a differential SCSI controller. The serial tty_1 line and the remote system control line are connected to the SGI IRIS console. The VME bus that is internal to the Challenge cabinet. It contains a COTS General Standards Corporation HPDI/VSIO board. The VCAM board provides the interface between the IO4 board #1 and the VME bus.

Figure 5-3 shows the architecture of IO4 board #2. The I-bus connects the various controllers to the E-bus. A fast and wide (F/W) differential SCSI II controller is connected to the Box Hill MDL1C-7-DLT4 Media Changer via Single-Ended-to-Differential converter. The FDDI controller is interfaced to the FDDI network via an optical bypass switch. The SCSI mezzanine board contains additional SCSI controllers. These additional fast and wide (F/W) differential SCSI II controllers of the mezzanine board are used for the transfer and the capture RAIDs. Each RAID can store up to 34 GBytes of data. The capture RAID is used to store the raw data prior to LOR processing. The transfer RAID stores the processed data prior to transfer to EDC DAAC. The Box Hill MDL1C-7-DLT4 Media Changer is used for backup or store the raw data for short-term data archiving. The Epson LQ-570PLUS (label) printer is connected to the parallel port. The other controllers are unused.

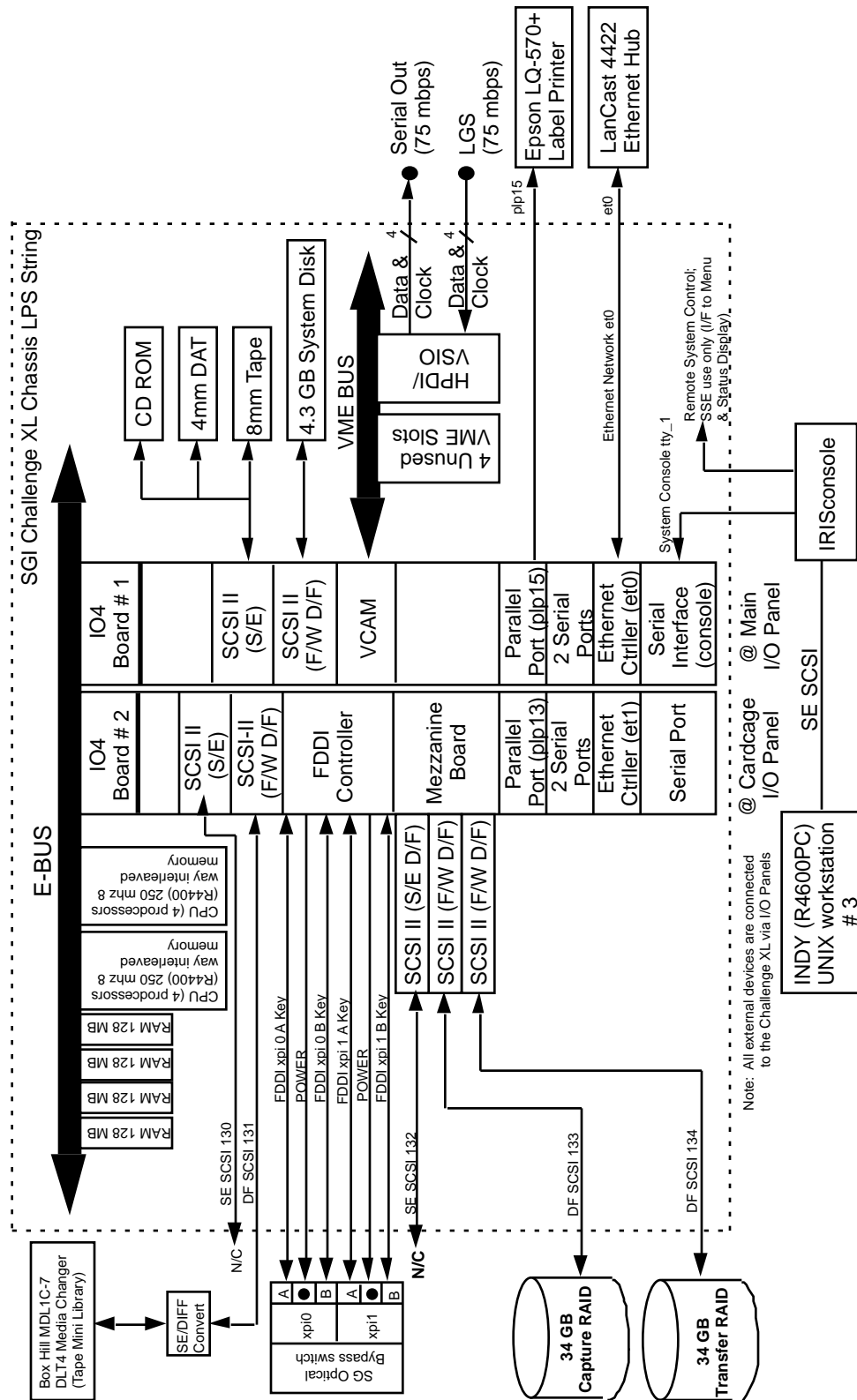


Figure 5-1 Challenge XL Architecture

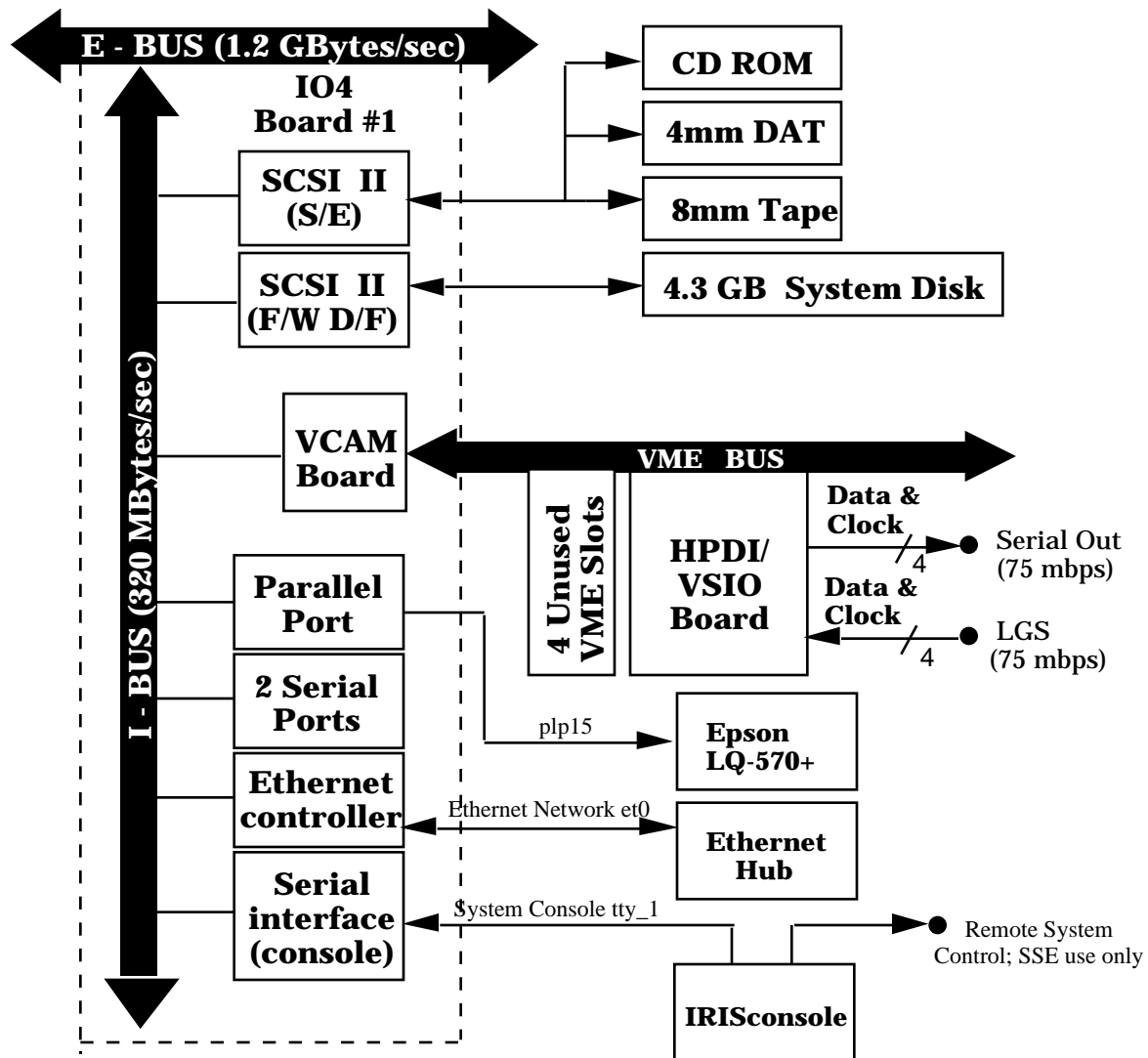


Figure 5-2. IO4 Board #1

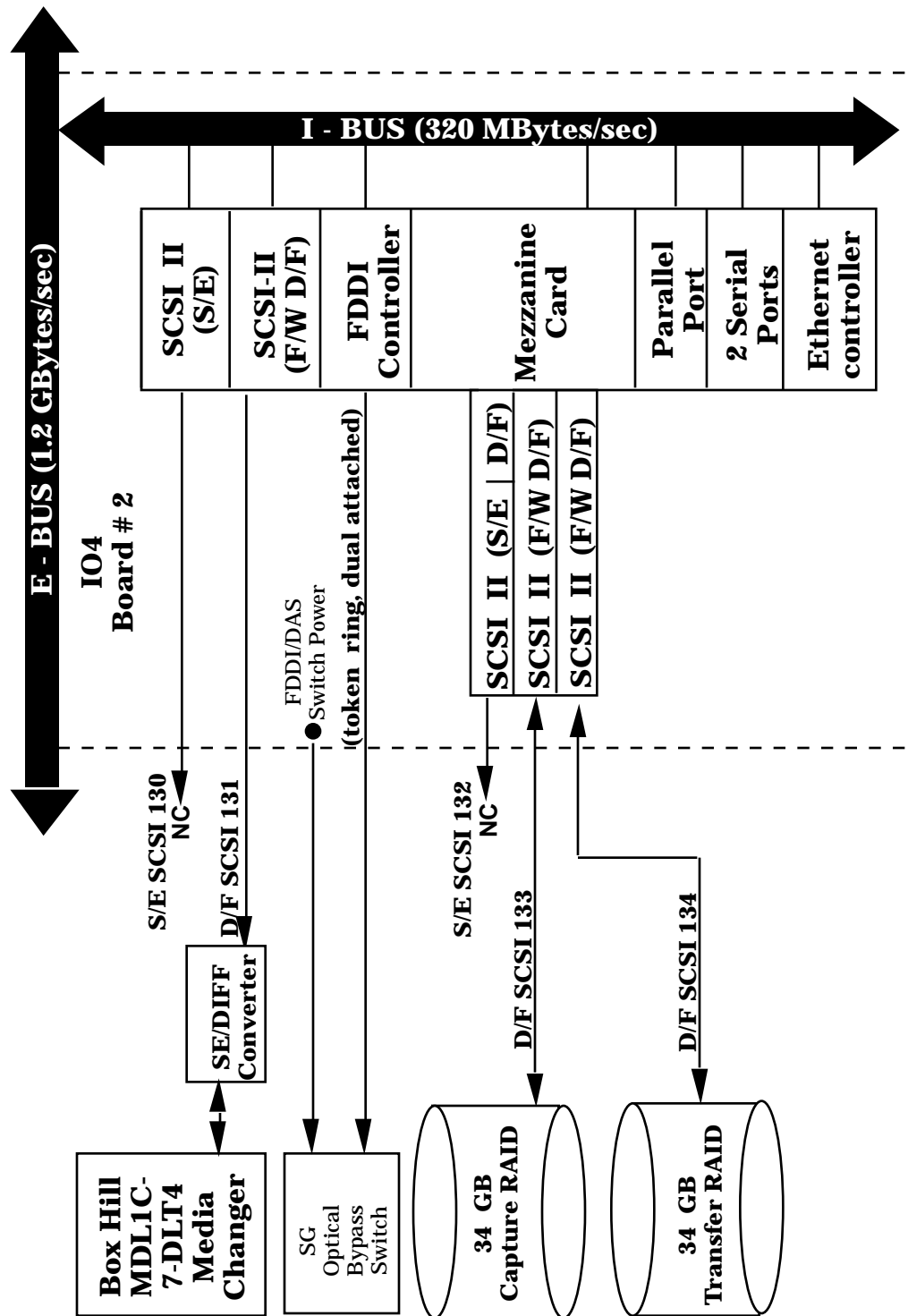


Figure 5-3. IO4 Board #2

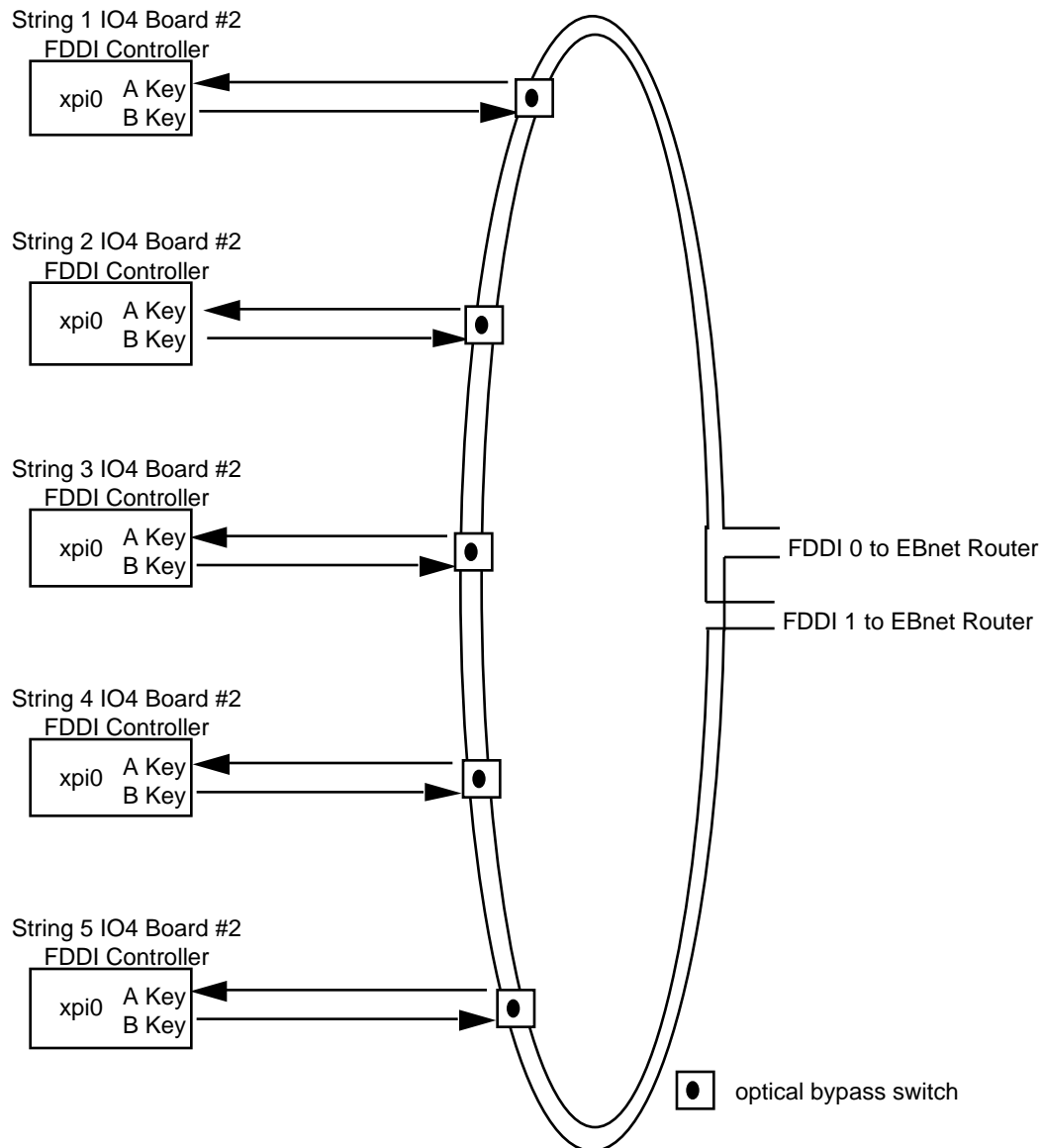


Figure 5-4. FDDI connections

Figure 5-4 details the token ring FDDI LAN connections. The FDDI LAN is dual attached to each Challenge XL for redundancy. The FDDI rings are connected to each Challenge XL's FDDI port (xpi0) via an optical bypass switch. The optical bypass switch is used to allow the FDDI LAN to remain unaffected if a Challenge XL is disconnected. The FDDI LAN provides the communications path to the EDC DAAC via the EBnet router at EDC.

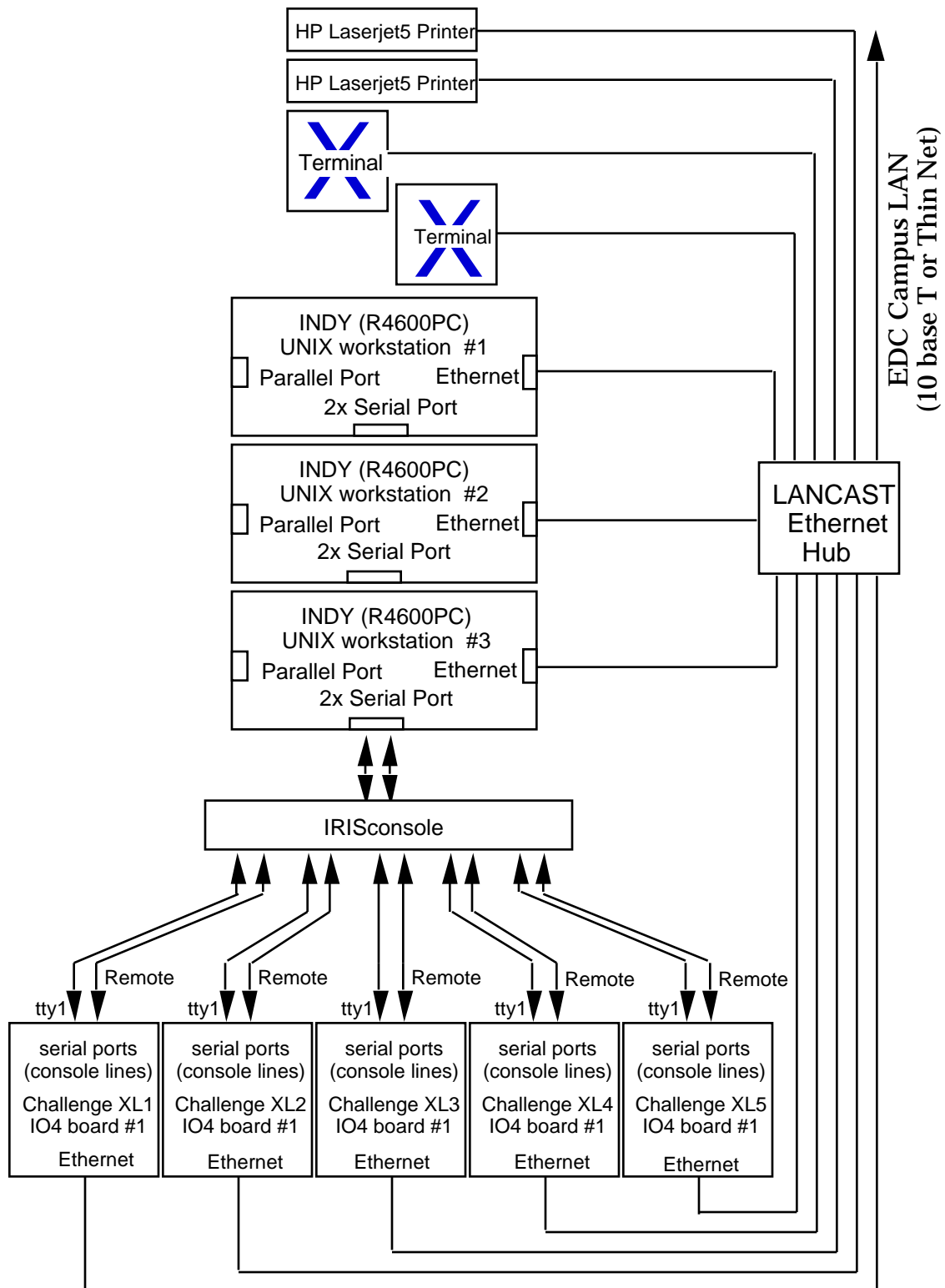


Figure 5-5. Indy, X-Terminal, Ethernet, and Console Line Diagram

Figure 5-5 shows the Ethernet and TTY serial console connections. The console line tty_1 and the remote line from each Challenge XL are connected to the IRISconsole. The IRISconsole is used to select which of these lines that will communicate with Indy #3. This allows Indy #3 to be used with any Challenge XL. The Ethernet connects the XLs, Indys, X-Terminals and LaserJet printers to each other and also to the EDC Campus LAN. Figure 5-6 shows the front view and the rear view of the Ethernet 10Base-T SuperHub model 4422.

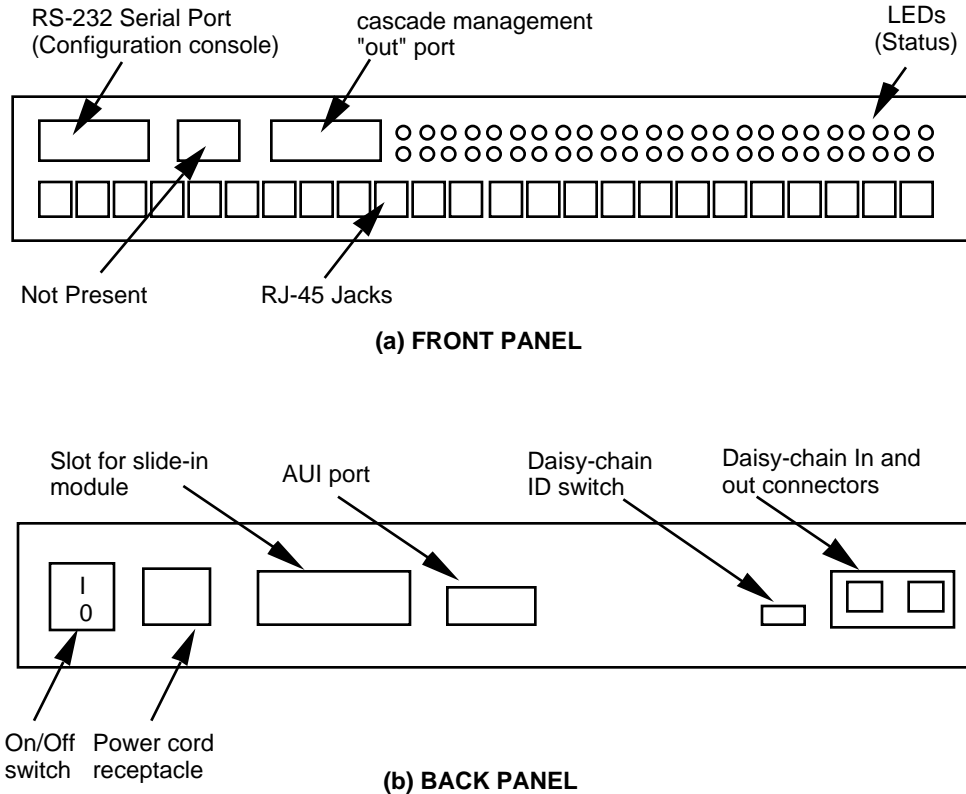


Figure 5-6. Ethernet 10Base-T SuperHub model 4422

5.2 Challenge XL VME Bus

The Challenge XL cabinet has an internal VME bus containing the COTS General Standards Corporation High Speed Parallel Digital Interface (HPDI)/Very high Speed Serial Interface (VSIO) board. This board is used to receive serial raw wideband data from LGS and transmit test data to LGS.

5.2.1 General Standards Corporation HPDI/VSIO Board

The High Speed Parallel Digital Interface (HPDI)/Very high Speed Serial Interface (VSIO) board is a standard 9U VMEbus COTS product. The HPDI/VSIO board is designed by General Standards Corporation. It provides a very high-speed serial data interface, a high-speed data conversion from serial-to-parallel and parallel-to-serial, and a very high-speed parallel digital interface to VMEbus.

The HPDI/VSIO board has two serial input and output channels. Each channel has separate clock and data. Differential ECL is used for serial signals interfacing; therefore, four interface signals are required for each channel (Data+, Data-, Clock+ and Clock-). The HPDI/VSIO board can receive or transmit a continuous serial data stream at speed of 75 Mbits per second.

The HPDI/VSIO board also has a data conversion logic which is used to convert data in real-time from serial-to-parallel or from parallel-to-serial. The data conversion logic is interfaced to a very high-speed parallel digital interface for high-speed transmission/reception of parallel digital data. This parallel digital interface logic supports data transfers over VMEbus (at rates up to 55 MBytes per second) and provides two banks of static RAM to allow for continuous high-speed non interrupted transfer of data.

In general, the HPDI/VSIO board is designed specially to receive or transmit a continuous serial stream of high-speed data. It provides data conversion and interfacing to SGI Challenge via VMEbus and VCAM. Refer to General Standards Corporation VSIO manual addendum to HPDI manual, rev. 003, July 17 1996 and VME-HPDI Users Manual, Oct. 25, 1995 for more details information of the HPDI/VSIO board.

5.3 RAID/DLT Cabinet

The RAID/DLT cabinet contains two Ciprico disk arrays (RAIDs), and one Box Hill MDL1C-7-DLT4 Media Changer.

5.3.1 Ciprico Disk Array (RAID)

Two Ciprico Inc. 6700 disk array subsystems, each referred to as a RAID, is included with each LPS string. These disk arrays

are connected to the SGI Challenge XL via a SCSI-2 differential fast/wide controller. The disk array contains eight 3.5-inch disk drives in parallel along with a ninth (parity) drive providing more than 34 GBytes (formatted) of data storage. The 34 GBytes storage capacity will allow the capture (data receipt and transfer to disk) of about 56 minutes of continuous data at the Landsat 7 data rate of 75 Mbits/second. The disk array subsystem contains redundant power supplies.

5.3.2 Box Hill MDL1C-7-DLT4 Media Changer

A Box Hill MDL1C-7-DLT4 Media Changer is included to each string of the LPS. The Box Hill MDL1C-7-DLT4 Media Changer is interfaced to the Challenge XL's F/W Differential controller port via a Paralan Single-Ended-to Differential converter. The Box Hill MDL1C-7-DLT4 Media Changer is a mini-library storage system with seven-cartridge (0.5-inch) library subsystems. It is primarily used to store capture raw wideband data.

Each Box Hill MDL1C-7-DLT4 Media Changer incorporates an elevator mechanism that provides direct or sequential cartridge access between the tape drive and cartridge magazine. The magazine loading feature allows up to seven cartridges to be managed as a complete set. The formatted capacities of 280 GB (assuming 2:1 compression) for each Box Hill MDL1C-7-DLT4 Media Changer and with sustained data transfer rate is 3.0 MB per second (peak transfer rate of 10 MBytes per second).

5.4 Peripherals

LPS peripherals include three Silicon Graphics Inc. Indy R4600PC workstations. These Indy workstations are provided for operator interface and the Moving Window Display. The IRISconsole is connected to Indy workstation No.3 and five Challenge XLs. The IRISconsole allows Indy workstation No.3 to control Challenge XLs. Two Network Computing Devices Inc. terminals (X-terms) that can be used by all five strings via Ethernet. Two HP LaserJet5 printers are connected to Ethernet LAN. Each string includes an Epson LQ-570+ (label) printer to generate cassette labels for the Box Hill MDL1C-7-DLT4 Media Changer, two Ciprico 6700/10 Disk array subsystem, and a BOX HILL MDL1C-7-DLT4 Media Changer. Five Challenge XLs, three Indy workstations, two X-terms, and two HP LaserJet 5

printers are connected to EDC network via a LANCAST Ethernet 10Base-T SuperHub.

5.5 Hardware Functional Description

The following subsections describe the detailed functional description of LPS.

5.5.1 Data Capture & Data Transmit

A Data Capture Flow Diagram is shown in Figure 5-7. Serial emitter-coupled-logic (ECL) data and clock are received by an LPS string HPDI/VSIO board. The HPDI/VSIO board is designed to receive serial data (raw ETM+ wideband data) from the LGS matrix switch at real-time rate of 75 Mbits/second, and convert serial data to parallel data. After the conversion, the data are then moved to two 256 KBytes buffers on the HPDI/VSIO card then from the HPDI/VSIO board into SGI system RAM across the VCAM VME-bus, the IO4 board #1 I-bus, and the SGI system E-bus. The peak transfer rates of the E-bus, the I-bus and the VME-bus are specified as 1.2 GBytes per second, 320 MBytes per second, and 40 MBytes per second, respectively. From SGI system RAM, where the data are memory mapped to a file, it is transferred to the data capture RAID via IO4 board #2 SCSI-2 controller which has a peak transfer rate of 20 MBytes per second. A Data Transmit Flow Diagram is shown in Figure 5-10, it is a reverse processing of the data capture.

Special device driver software was written especially for the HPDI/VSIO board. This device driver facilitates the capture and playing back of raw ETM+ wideband data by the LPS strings. It works by establishing two memory buffer buckets, through DMA procedures and low level interrupts. It loads the raw ETM+ wideband data into memory with almost no intervention of the system's eight CPUs.

5.5.2 Data Storage

Once the capture of data is completed, the data are stored on Box Hill MDL1C-7-DLT4 Media Changer. Figure 5-8 is shown Data Store Flow Diagram from Capture RAID to Box Hill MDL1C-

7-DLT4 Media Changer. The data are transferred from Capture RAID to Box Hill MDL1C-7-DLT4 Media Changer via SCSI ports of IO4 board #2 and SGI system RAM. The Box Hill MDL1C-7-DLT4 Media Changer has a sustained transfer rate of 3 MBytes per second and a peak transfer rate of 10 MBytes per second. Each cartridge of Box Hill MDL1C-7-DLT4 Media Changer is stored up to 40 GBytes (assumes 2:1 data compression) of data. Each Box Hill MDL1C-7-DLT4 Media Changer library has seven cartridges, which provide the storage capacity up to 280 GBytes (assumes 2:1 data compression) of data.

5.5.3 Data Processing

A data processing flow diagram is shown in Figure 5-9. The wideband data, which are stored on Capture RAID is processed by SGI Challenge XL to generate Level OR data format. The Level OR data are temporary stored on transfer RAID before transferring to EDC DAAC.

As shown in Figure 5-9, the wideband data from Capture RAID is transferred to SGI Challenge XL processors via a SCSI-2 port on the mezzanine board of IO4 board #2 and the SGI Challenge XL E-bus. During the processing, the Level OR data output is transferred to Transfer RAID via another SCSI-2 port on the mezzanine board of IO4 board #2 and the SGI Challenge XL E-bus.

The serial data output flow is the reverse of Figure 5-7 and similarly the playback of data from the Box Hill MDL1C-7-DLT4 Media Changer to the RAID is the reverse of Figure 5-8.

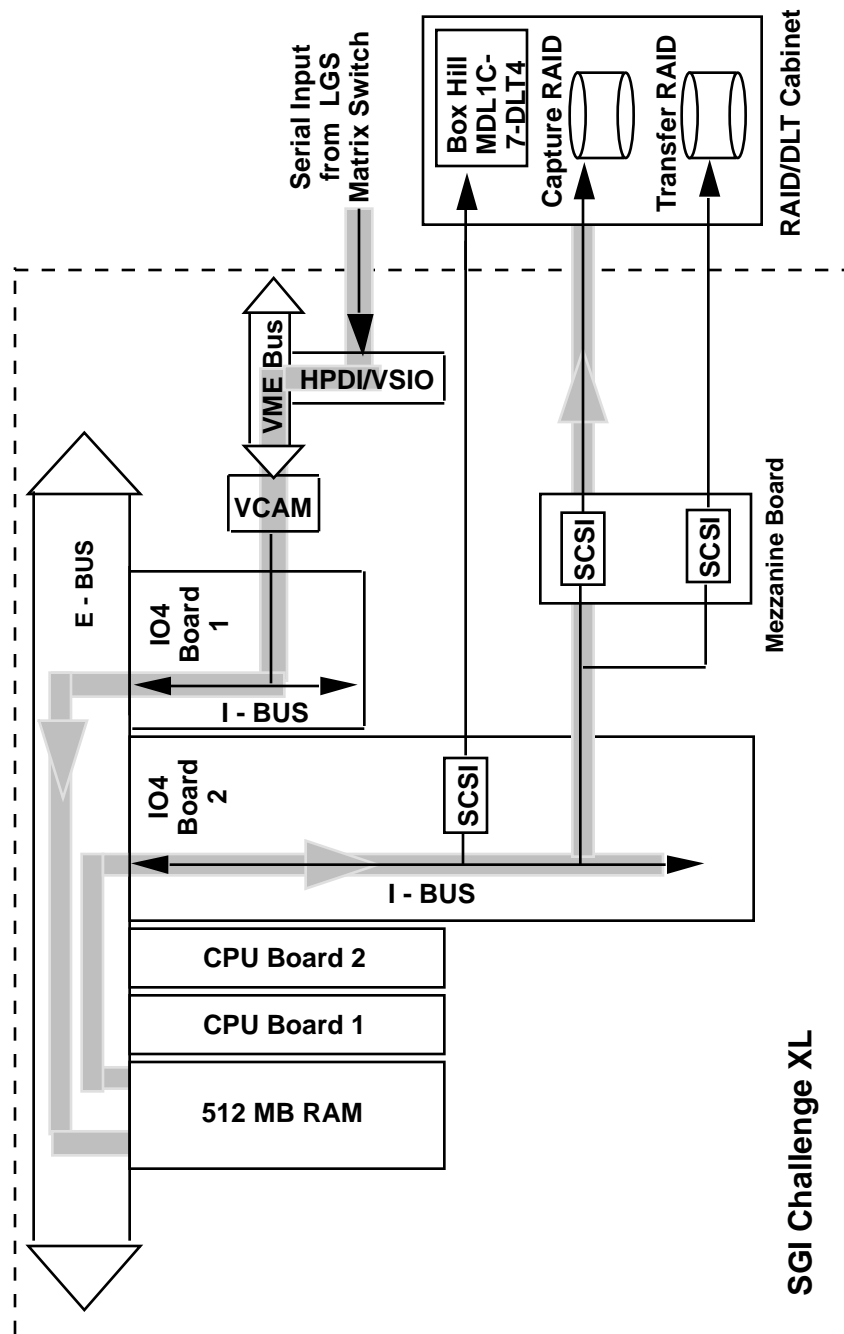


Figure 5-7. Data Capture Flow Diagram

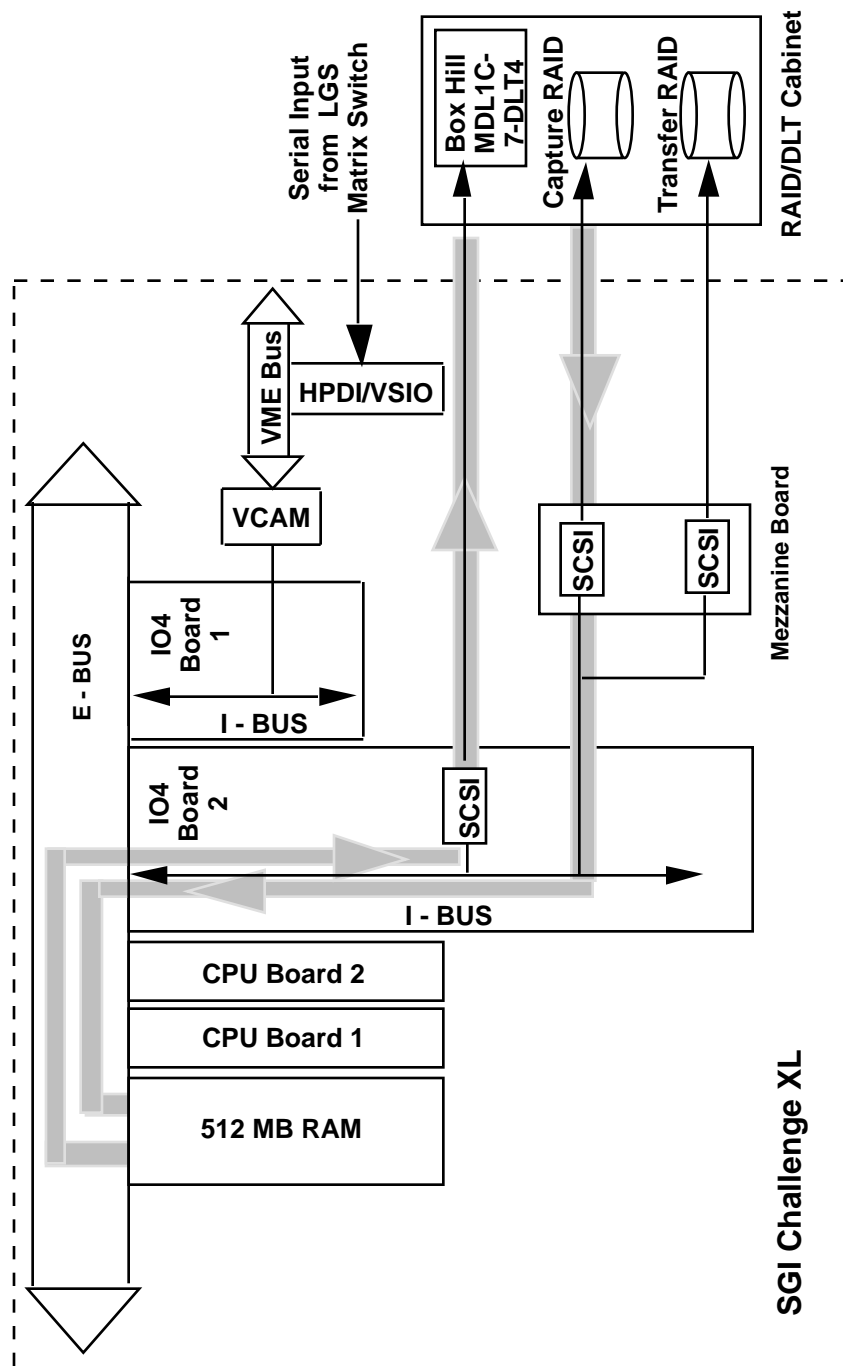


Figure 5-8. Data Store Flow Diagram

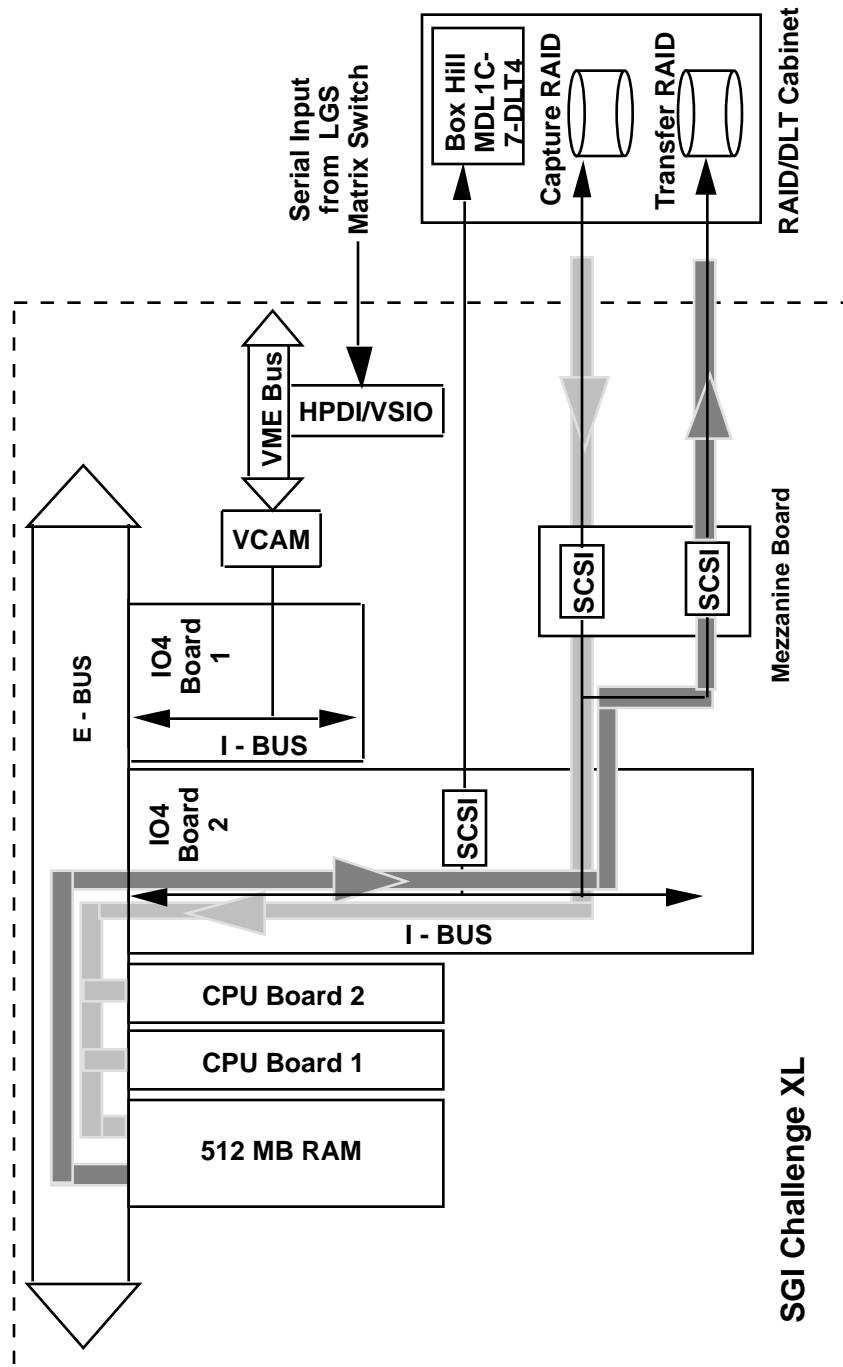


Figure 5-9. Data Processing Flow Diagram

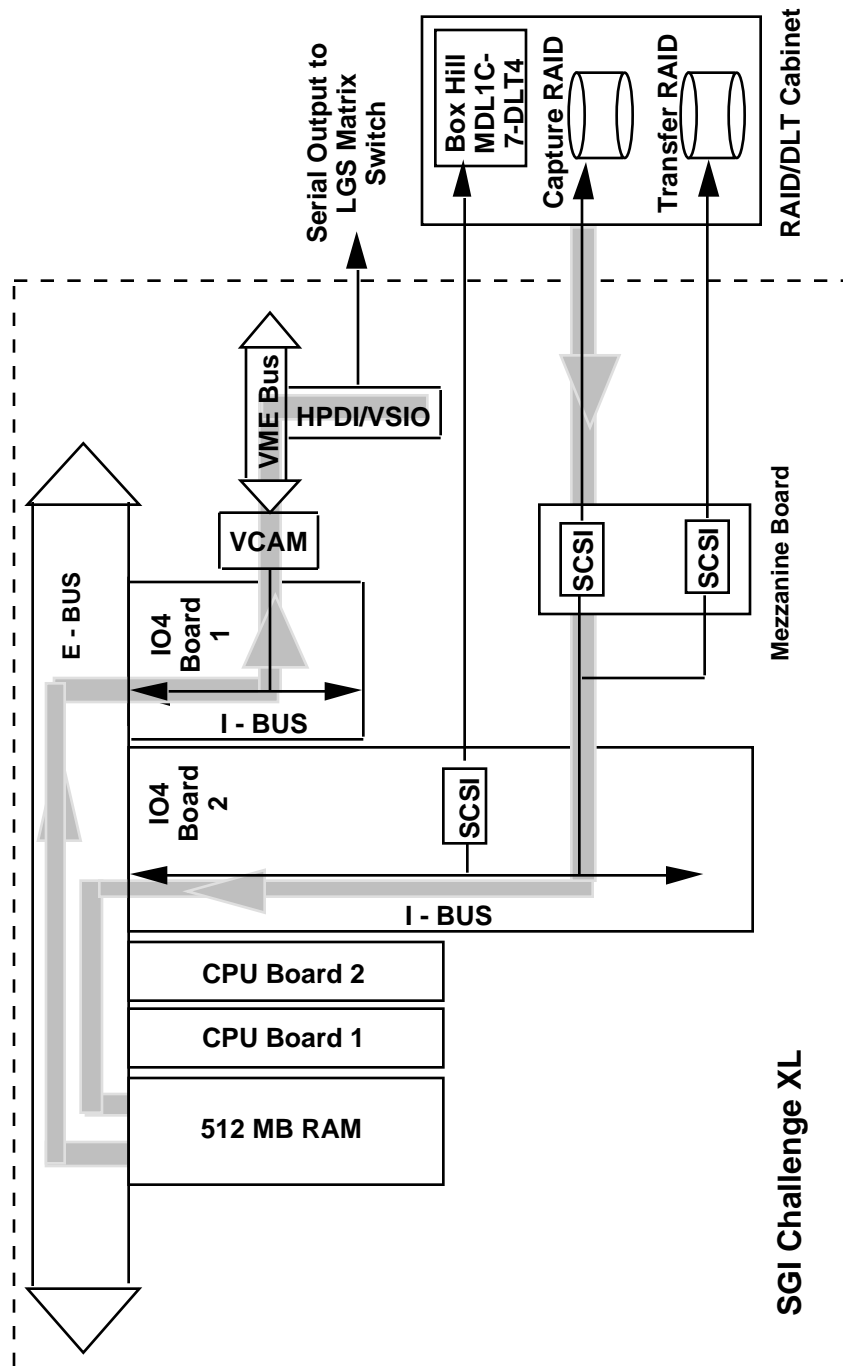


Figure 5-10. Data Transmit Flow Diagram

Section 6 — Maintenance

This section provides preventative and corrective maintenance information for the LPS. The information includes instructions for cleaning, troubleshooting, and repairing LPS components.

6.1 Preventative Maintenance

Refer to Appendix F for preventative maintenance schedule.

6.1.1 SGI Challenge XL

The SGI documentation contains preventative maintenance information. Refer to the SGI Power Challenge XL Rackmount Owner's Guide (Vendor Document 1.5.8), Appendix B for information on the following:

1. Cleaning the 4mm DAT and 8mm tape drives
2. CD-ROM maintenance

6.1.2 Ciprico Disk Array

Refer to the Ciprico AD6700/10 Disk Array Guide and Addendum (Vendor Document 1.5.4) Chapter 6 for instructions on the following:

1. Cleaning the air filter
2. Verifying cooling fan operation
3. Verifying power supply fan operation

6.1.3 Box Hill MDL1C-7-DLT4 Media Changer

Refer to Using Box Hill MDL1C-7-DLT4 Media Changer (Vendor Document 1.5.10) for cleaning and maintenance information.

6.1.4SGI Indy Workstation

The workstation does not require routine maintenance because drives are not provided with the workstation. Power-on self-tests are run automatically. Follow the "Hardware and Software Do's and Don'ts" described in Chapter 9, "Safety, Maintenance and Regulatory Information" of the Indy Workstation Owner's Guide (Vendor Document 1.5.7)

6.1.5NCD Terminal

Refer to the document About Your 21-Inch Color Monitor NC2185AA (Vendor Document 1.5.1) for monitor care and adjustments to be performed as needed.

6.1.6HP LaserJet 5 Printer

Refer to the Hewlett-Packard Laserjet 5 and 5M Printer User's Manual (Vendor Document 1.5.11) Chapter 8 for maintenance and adjustment of the printer.

6.1.7Epson LQ-570+ (Label) Printer

Refer to the Epson LQ-570+ User's Guide (Vendor Document 1.5.15), Chapter 5, pages 5-2 and 5-3 for cleaning the printer and replacing the ribbon, respectively.

6.1.8SGI IRISconsole

Preventative maintenance is not required for IRISconsole device.

6.1.9LANCAST Ethernet 10Base-T SuperHub

Preventative maintenance is not required for Ethernet 10Base-T SuperHub

6.1.10 General Standards Corporation HPDI/VSIO Board

Preventative maintenance is not required for HPDI/VSIO board

6.2 Corrective Maintenance

6.2.1SGI Challenge XL

SGI field service is contracted to maintain the Challenge XL. The SGI documentation contains corrective maintenance information that is useful to EDC maintenance personnel. Refer to following sections of the SGI Power Challenge and Challenge XL Rackmount Owner's Guide (Vendor Document 1.5.8):

1. Chapter 5, "Having Trouble," can be used to diagnose system faults.
2. Chapter 4 contains information on installing peripherals.
3. Appendix D discusses PROM and mezzanine troubleshooting.

If the Challenge XL system disk has been replaced, refer to Section 4 of this document for installing the LPS operating system software, and hardware setup. The operating system will be installed by SGI field service.

6.2.2Ciprico Disk Array

Refer to the Ciprico AD6700/10 Disk Array Guide and Addendum (Vendor Document 1.5.4), Chapters 4 and 5 for instructions on the following:

1. Drive failures and rebuild
2. Replacing a failed power supply

Failures are reported through the display panel and the audio alarm (if enabled).

The display panel operation is described in Chapter 3 of the *Ciprico AD6700/10 Disk Array Guide and Addendum* (Vendor Document 1.5.4). A BIST is performed

on powerup. The self test codes are described in Chapter 3 (Troubleshooting) of the *AD6700 Integrated Disk Array Quick installation Guide* (Vendor Document 1.5.3).

6.2.3Box Hill MDL1C-7-DLT4 Media Changer

Refer to Box Hill MDL1C-7-DLT4 Media Changer (Vendor Document 1.5.10) for troubleshooting information and possible solutions to potential problems.

6.2.4SGI Indy Workstation

Refer to the Indy Workstation Owner's Guide (Vendor Document 1.5.7). Chapter 7 "Troubleshooting" provides information on installing and removing hardware and software components. Other information is included that is useful for diagnosing problems and identifying faults.

6.2.5NCD Terminal

Refer to the documents About Your 21-Inch Color Monitor NC2185AA (Vendor Document 1.5.1) and Installing Your HMX Family System (Vendor Document 1.5.2) for troubleshooting information and obtaining technical support.

6.2.6HP LaserJet 5 Printer

Refer to Chapter 7 of the Hewlett-Packard LaserJet 5 and 5M Printer User's Manual (Vendor Document 1.5.11) for detail information on how to solve the printer problems.

6.2.7Epson LQ-570+ (Label) Printer

Refer to the Epson LQ-570+ User's Guide (Vendor Document 1.5.15). Chapter 6 "Troubleshooting" provides information on power supply, printing and paper-handling problems. Other

information about the technical specifications and command summary can also be found in Chapter 7 and Chapter 8, respectively.

6.2.8SGI IRISconsole

Check the cable for each system connected to the IRISconsole device to determine the multiplexer port to which each system's Remote System Control and System Console ports are connected. Using the Challenge XL Multiplexer Port Connection Table below as a reference in determining which serial ports are used for which Challenge XL.

Challenge XL Multiplexer Port Connection Table:

| Challenge XL Hostname | Multiplexer Port Number | |
|-----------------------|-------------------------|----------------|
| | Remote System Control | System Console |
| LPS001 | 01 | 09 |
| LPS002 | 02 | 10 |
| LPS003 | 03 | 11 |
| LPS004 | 04 | 12 |
| LPS005 | 05 | 13 |

6.2.9LANCAST Ethernet 10Base-T SuperHub

Refer to Appendixes A and C for the cable interconnection information. Check the ethernet cable of each system connected to the Ethernet Hub to determine the 10 Base-T ports connection

6.2.10 General Standards Corporation HPDI/VSIO

Refer to General Standards Corporation VSIO manual addendum to HPDI manual, rev. 003, July 17 1996 and VME-HPDI Users Manual, Oct. 25, 1995 for more details information of the HPDI/VSIO board. Review the component layout of HPDI/VSIO board and check jumpers setting. Using the transfer command to transfer a standard test file from one string to another via HPDI/VSIO input/output ports and using

the file comparison to verify the error. Or using test program, "TESTHPDI", provided with LPS Raw Data Capture Subsystem to check out the HPDI/VSIO board.

Appendix A—LPS Parts List

| System Name | Qty | Manufacture | Part No. |
|--|-----|--|----------------------|
| Challenge XL System | | | |
| Challenge XL Rackmount | 5 | Silicon Graphics Inc. | R-49808-S4 |
| 128MB RAM Board | 20 | Silicon Graphics Inc. | H4-128-MEMSYS-2 |
| CPU Board | 10 | Silicon Graphics Inc. | 030-0804-101 |
| IO4 Board w/o mezzanine | 10 | Silicon Graphics Inc. | HU-PC2 |
| SCSI Mezzanine Board | 5 | Silicon Graphics Inc. | P-S-HIO SCSI |
| 4.3 GB System Disk | 6 | Silicon Graphics Inc. | 013-1512-001 |
| Compact Disk (CD-ROM) | 5 | Silicon Graphics Inc. | P8-CDROM-4X |
| 4mm Digital Audio Tape (DAT) Drive | 5 | Silicon Graphics Inc. | P8-S-00S2 |
| 8mm Tape Drive | 5 | Silicon Graphics Inc. | P8-S-8MM |
| FDDI | 5 | Silicon Graphics Inc. | C8-FDDIXPH |
| Optical Bypass Switch | 5 | Silicon Graphics Inc. | SGI C4-FDDI-SWT-1.0P |
| HPDI/VSIO Board | 5 | General Standard Corporation | VME-VSIO-1 |
| IRISconsole | 1 | Silicon Graphics Inc. | C0-IRISCONSOLE |
| Indy Workstation | | | |
| System | 3 | Silicon Graphics Inc. | W8A1-5032 |
| Monitor | 3 | Silicon Graphics Inc. | GMD20D11 |
| Box Hill MDL1C-7-DLT4 Media Changer | 5 | Box Hill Systems Corporation | MDL1C-7-DLT4 |
| Paralan SCSI SE/DF Converter | 5 | Paralan Corporation | SD16B |
| 6700 Disk Arrays, Model AR 6702 | 10 | Ciprico Inc. | AS6714-3A |
| Epson LQ-570PLUS printer | 5 | Epson America Inc. | 555-374 |
| HP LaserJet 5 printer | 2 | Hewlett-Packard | C3916A#ABA |
| X-Terminal | | | |
| 21 Inch Color Monitor NC2185AA | 2 | Network Computing Devices Inc. | NC2185-AA |
| HMX System | 2 | Network Computing Devices Inc. | NCD-HMX |
| Ethernet 10Base-T SuperHub, Model 4422 | 1 | LANCAST Standard Hierarchical Networks | SuperHub 4422 |

Appendix B—LPS Interconnection Cable List

| Ref. No. | From | To |
|---|--------------------------|----------------------------|
| Interconnection cable between Challenge XL and RAID5 | | |
| 001 | LPS001_DF SCSI 134 | LPS001_Transfer RAID |
| 002 | LPS002_DF SCSI 134 | LPS002_Transfer RAID |
| 003 | LPS003_DF SCSI 134 | LPS003_Transfer RAID |
| 004 | LPS004_DF SCSI 134 | LPS004_Transfer RAID |
| 005 | LPS005_DF SCSI 134 | LPS005_Transfer RAID |
| 006 | LPS001_DF SCSI 133 | LPS001_Capture RAID |
| 007 | LPS002_DF SCSI 133 | LPS002_Capture RAID |
| 008 | LPS003_DF SCSI 133 | LPS003_Capture RAID |
| 009 | LPS004_DF SCSI 133 | LPS004_Capture RAID |
| 010 | LPS005_DF SCSI 133 | LPS005_Capture RAID |
| Interconnection cable between Challenge XLs and BOX HILLS MDL1C-7-DLT4 via Single-Ended-to-Differential Converter (SE/DF-CONV) | | |
| 011 | LPS001_DF SCSI 131 | LPS001_SE/DF-CONV_DF |
| 012 | LPS002_DF SCSI 131 | LPS002_SE/DF-CONV_DF |
| 013 | LPS003_DF SCSI 131 | LPS003_SE/DF-CONV_DF |
| 014 | LPS004_DF SCSI 131 | LPS004_SE/DF-CONV_DF |
| 015 | LPS005_DF SCSI 131 | LPS005_SE/DF-CONV_DF |
| 016 | LPS001_SE/DF-CONV_SE | LPS001_BOXHILL_DLT4700 |
| 017 | LPS002_SE/DF-CONV_SE | LPS002_BOXHILL_DLT4700 |
| 018 | LPS003_SE/DF-CONV_SE | LPS003_BOXHILL_DLT4700 |
| 019 | LPS004_SE/DF-CONV_SE | LPS004_BOXHILL_DLT4700 |
| 020 | LPS005_SE/DF-CONV_SE | LPS005_BOXHILL_DLT4700 |
| Interconnection cable between Ethernet 10Base-T SuperHub and Systems | | |
| 021 | LANCAST_10Base-T Port 1 | LPS001_Ethernet_et0 |
| 022 | LANCAST_10Base-T Port 2 | LPS002_Ethernet_et0 |
| 023 | LANCAST_10Base-T Port 3 | LPS003_Ethernet_et0 |
| 024 | LANCAST_10Base-T Port 4 | LPS004_Ethernet_et0 |
| 025 | LANCAST_10Base-T Port 5 | LPS005_Ethernet_et0 |
| 026 | LANCAST_10Base-T Port 6 | X-Terminal 1_Ethernet Port |
| 027 | LANCAST_10Base-T Port 7 | X-Terminal 2_Ethernet Port |
| 028 | LANCAST_10Base-T Port 8 | Indy W/S 1_Ethernet Port |
| 029 | LANCAST_10Base-T Port 9 | Indy W/S 2_Ethernet Port |
| 030 | LANCAST_10Base-T Port 10 | Indy W/S 3_Ethernet Port |
| 031 | LANCAST_10Base-T Port 11 | HP LaserJet 5 Printer 1 |
| 032 | LANCAST_10Base-T Port 12 | HP LaserJet 5 Printer 2 |
| 033 | LANCAST_BNC Port | EDC Exchange LAN |

| Ref. No. | From | To |
|---|-----------------------|------------------------------|
| Interconnection cable between FDDI Ring and Systems | | |
| 034 | LPS001_FDDI_Ch.A | LPS002_FDDI_Ch.B |
| 035 | LPS002_FDDI_Ch.A | LPS003_FDDI_Ch.B |
| 036 | LPS003_FDDI_Ch.A | LPS004_FDDI_Ch.B |
| 037 | LPS004_FDDI_Ch.A | LPS005_FDDI_Ch.B |
| 038 | LPS005_FDDI_Ch.A | EBnet_E7513_Ch.B |
| 039 | EBnet_E7513_Ch.A | EBnet_E4700_Ch.B |
| 040 | EBnet_E4700_Ch.A | LPS001_FDDI_Ch.B |
| Interconnection cable between IRISconsole and Systems | | |
| 041 | IRISconsole_SCSI Port | Indy W/S 3_SCSI Port |
| 042 | IRISconsole_Port 09 | LPS001_System Console tty_1 |
| 043 | IRISconsole_Port 01 | LPS001_Remote System Console |
| 044 | IRISconsole_Port 10 | LPS002_System Console tty_1 |
| 045 | IRISconsole_Port 02 | LPS002_Remote System Console |
| 046 | IRISconsole_Port 11 | LPS003_System Console tty_1 |
| 047 | IRISconsole_Port 03 | LPS003_Remote System Console |
| 048 | IRISconsole_Port 12 | LPS004_System Console tty_1 |
| 049 | IRISconsole_Port 04 | LPS004_Remote System Console |
| 050 | IRISconsole_Port 13 | LPS005_System Console tty_1 |
| 051 | IRISconsole_Port 05 | LPS005_Remote System Console |
| Interconnection cable between Challenge XLs and LGS Matrix Switch (MS) | | |
| 052 | LPS001_Data+_Out | LGS MS_LPS1_IN_DATA |
| 053 | LPS001_Data-_Out | LGS MS_LPS1_IN_/DATA |
| 054 | LPS001_Clock+_Out | LGS MS_LPS1_IN_CLK |
| 055 | LPS001_Clock-_Out | LGS MS_LPS1_IN_/CLK |
| 056 | LPS001_Data+_In | LGS MS_LPS1_OUT_DATA |
| 057 | LPS001_Data-_In | LGS MS_LPS1_OUT_/DATA |
| 058 | LPS001_Clock+_In | LGS MS_LPS1_OUT_CLK |
| 059 | LPS001_Clock-_In | LGS MS_LPS1_OUT_/CLK |
| 060 | LPS002_Data+_Out | LGS MS_LPS2_IN_DATA |
| 061 | LPS002_Data-_Out | LGS MS_LPS2_IN_/DATA |
| 062 | LPS002_Clock+_Out | LGS MS_LPS2_IN_CLK |
| 063 | LPS002_Clock-_Out | LGS MS_LPS2_IN_/CLK |
| 064 | LPS002_Data+_In | LGS MS_LPS2_OUT_DATA |
| 065 | LPS002_Data-_In | LGS MS_LPS2_OUT_/DATA |
| 066 | LPS002_Clock+_In | LGS MS_LPS2_OUT_CLK |
| 067 | LPS002_Clock-_In | LGS MS_LPS2_OUT_/CLK |

| Ref. No. | From | To |
|---|----------------------------|-----------------------|
| 068 | LPS003_Data+_Out | LGS MS_LPS3_IN_DATA |
| 069 | LPS003_Data-_Out | LGS MS_LPS3_IN_/DATA |
| 070 | LPS003_Clock+_Out | LGS MS_LPS3_IN_CLK |
| 071 | LPS003_Clock-_Out | LGS MS_LPS3_IN_/CLK |
| 072 | LPS003_Data+_In | LGS MS_LPS3_OUT_DATA |
| 073 | LPS003_Data-_In | LGS MS_LPS3_OUT_/DATA |
| 074 | LPS003_Clock+_In | LGS MS_LPS3_OUT_CLK |
| 075 | LPS003_Clock-_In | LGS MS_LPS3_OUT_/CLK |
| 076 | LPS004_Data+_Out | LGS MS_LPS4_IN_DATA |
| 077 | LPS004_Data-_Out | LGS MS_LPS4_IN_/DATA |
| 078 | LPS004_Clock+_Out | LGS MS_LPS4_IN_CLK |
| 079 | LPS004_Clock-_Out | LGS MS_LPS4_IN_/CLK |
| 080 | LPS004_Data+_In | LGS MS_LPS4_OUT_DATA |
| 081 | LPS004_Data-_In | LGS MS_LPS4_OUT_/DATA |
| 082 | LPS004_Clock+_In | LGS MS_LPS4_OUT_CLK |
| 083 | LPS004_Clock-_In | LGS MS_LPS4_OUT_/CLK |
| 084 | LPS005_Data+_Out | LGS MS_LPS5_IN_DATA |
| 085 | LPS005_Data-_Out | LGS MS_LPS5_IN_/DATA |
| 086 | LPS005_Clock+_Out | LGS MS_LPS5_IN_CLK |
| 087 | LPS005_Clock-_Out | LGS MS_LPS5_IN_/CLK |
| 088 | LPS005_Data+_In | LGS MS_LPS5_OUT_DATA |
| 089 | LPS005_Data-_In | LGS MS_LPS5_OUT_/DATA |
| 090 | LPS005_Clock+_In | LGS MS_LPS5_OUT_CLK |
| 091 | LPS005_Clock-_Out | LGS MS_LPS5_OUT_/CLK |
| Interconnection cable between Challenge XLs and Epson LQ-570+ (Label Printers) | | |
| 092 | LPS001_Parallel Port_plp15 | LPS001_Label Printer |
| 093 | LPS002_Parallel Port_plp15 | LPS002_Label Printer |
| 094 | LPS003_Parallel Port_plp15 | LPS003_Label Printer |
| 095 | LPS004_Parallel Port_plp15 | LPS004_Label Printer |
| 096 | LPS005_Parallel Port_plp15 | LPS005_Label Printer |

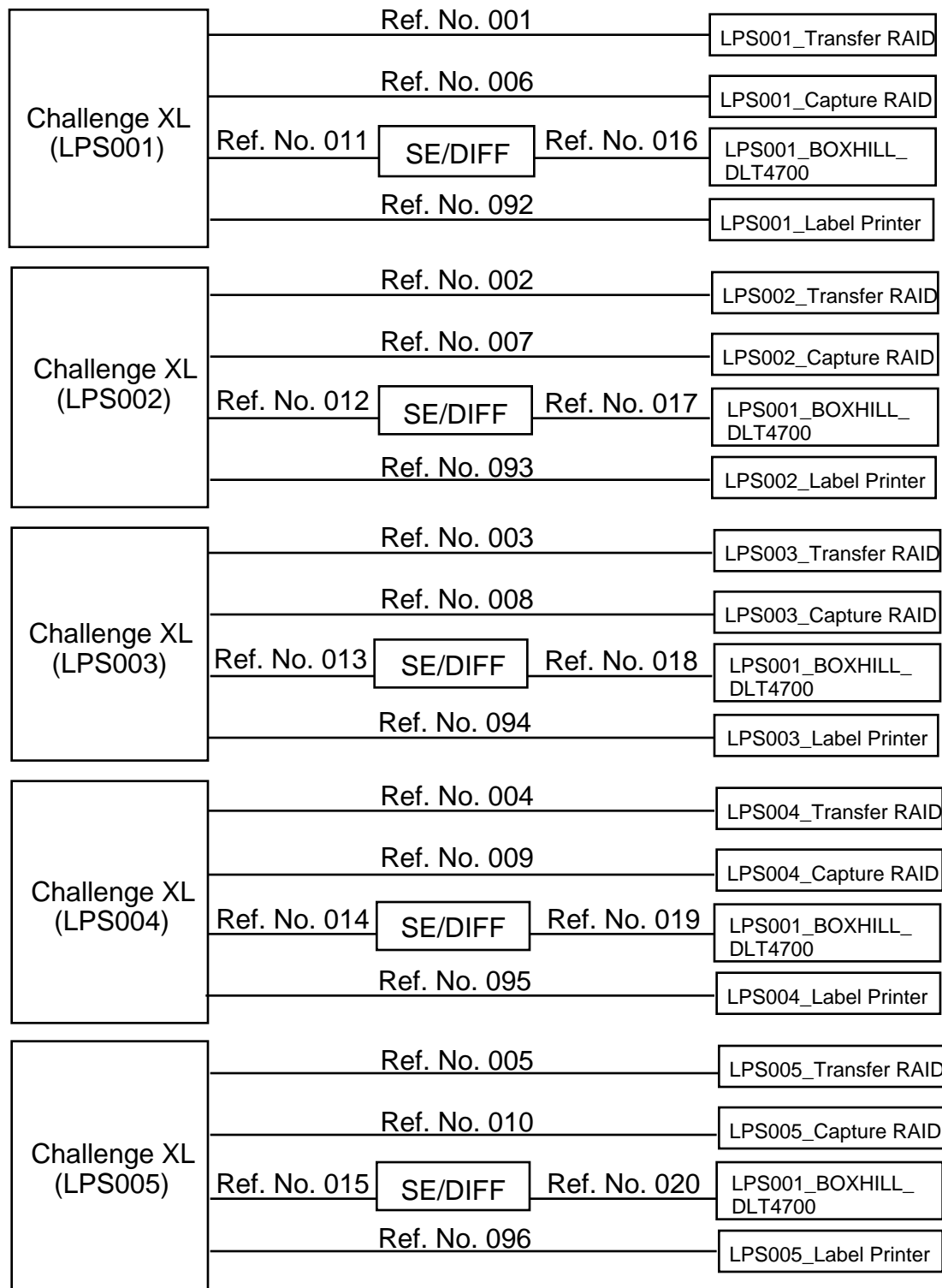
*** Cable Labeling Scheme:**

Each end of cable is labeled by the following scheme:

FROM <system name>_<port name>_<signal name>_<input/output>

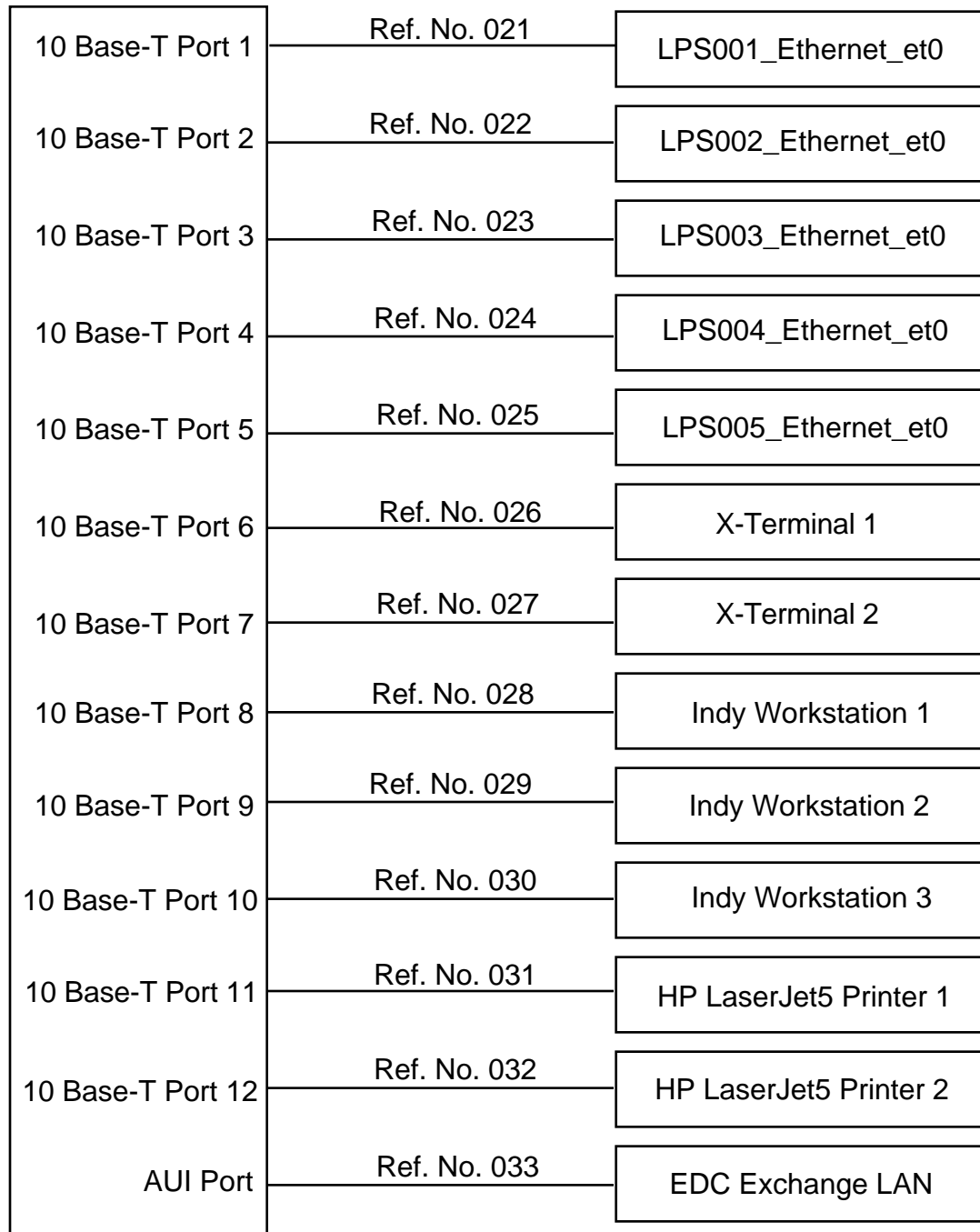
TO <system name>_<port name>_<signal name>_<input/output>

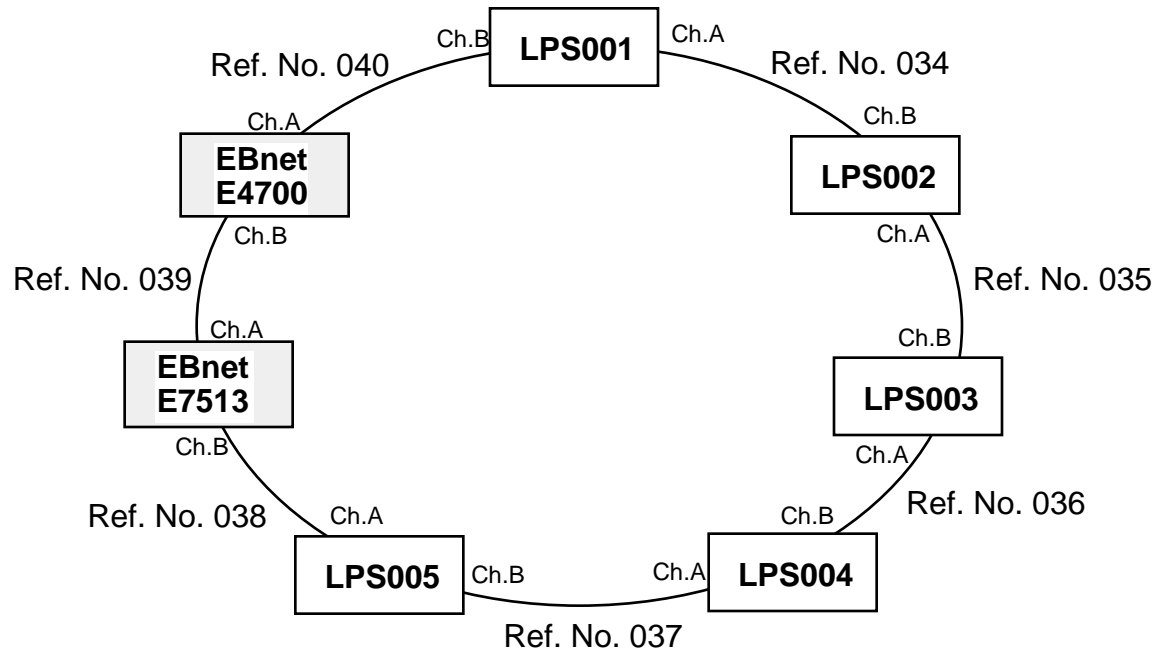
Appendix C—LPS Interconnection Diagrams

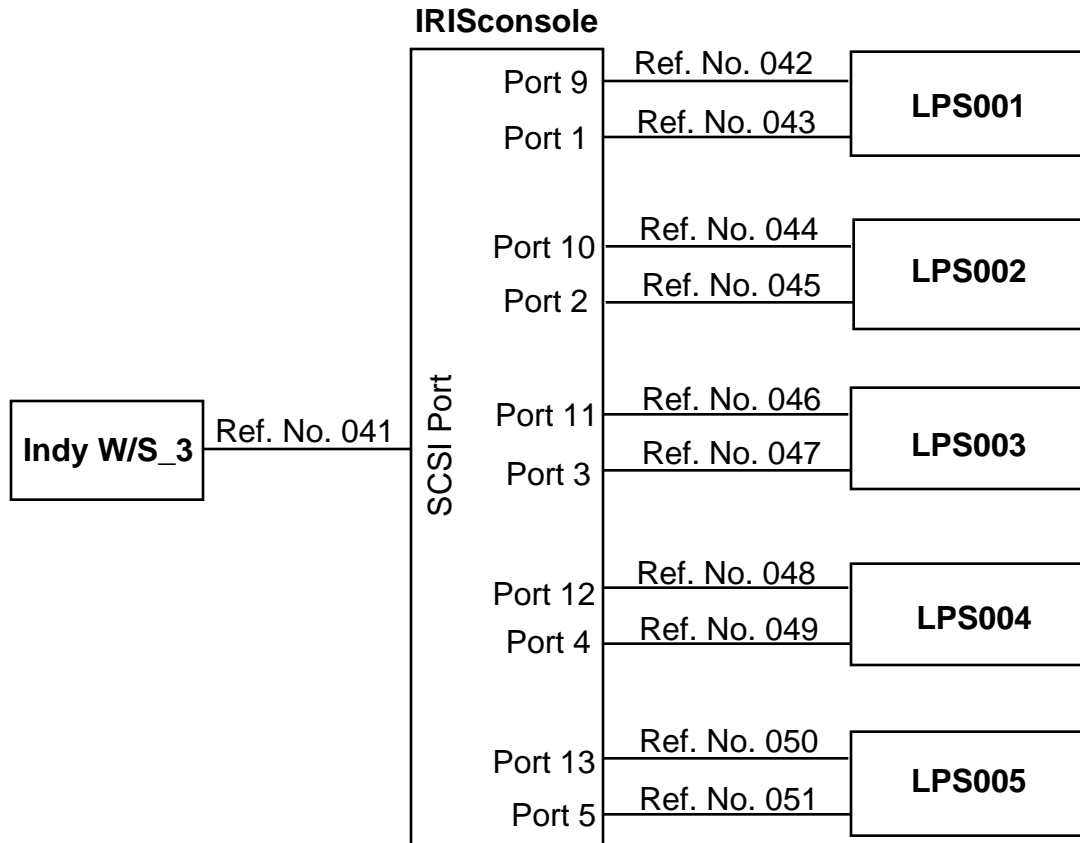


Challenge XLs and Other Devices Interconnection Diagram

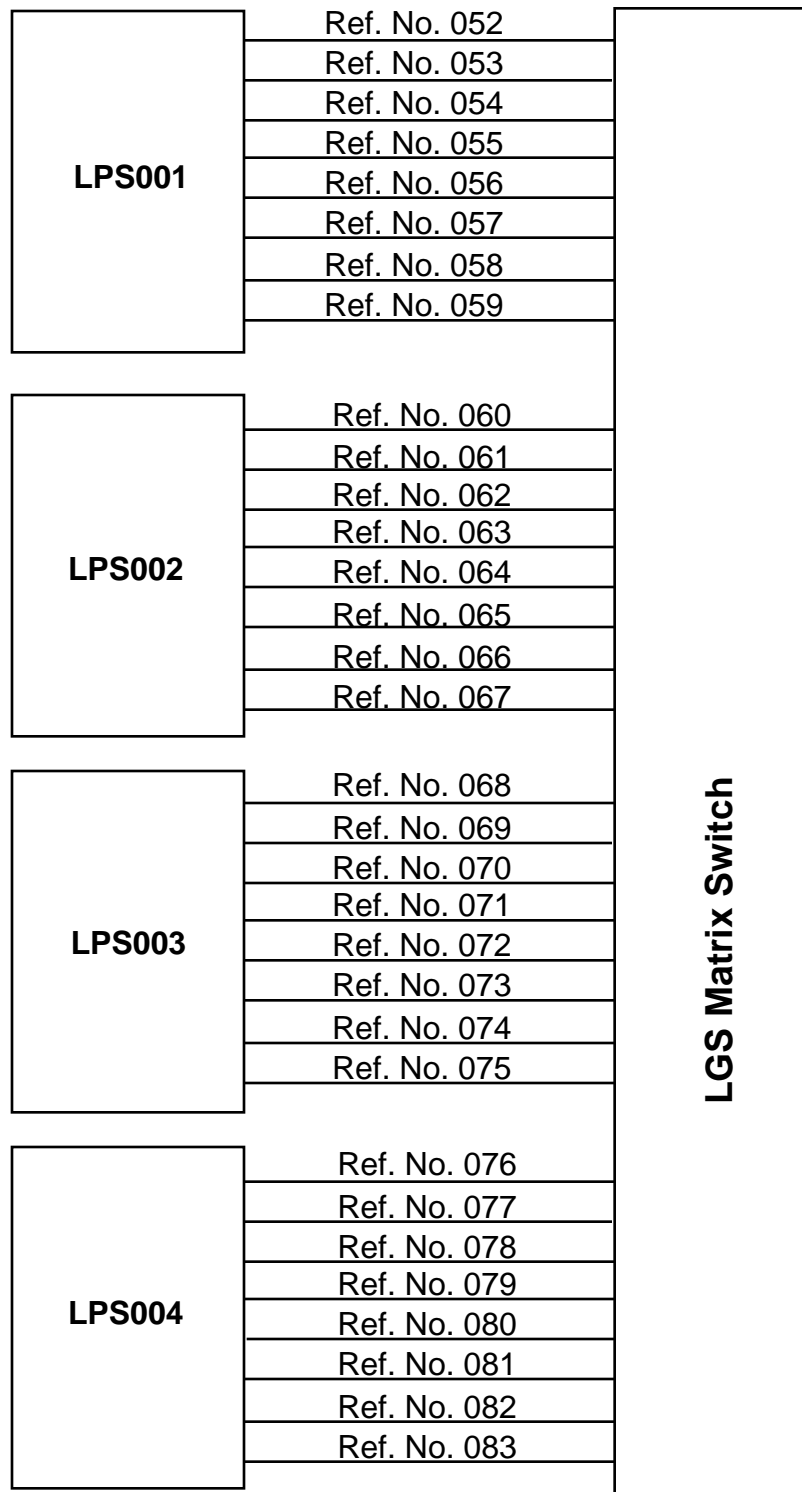
LANCast Ethernet Hub

**LPS Ethernet Network Interconnection Diagram**

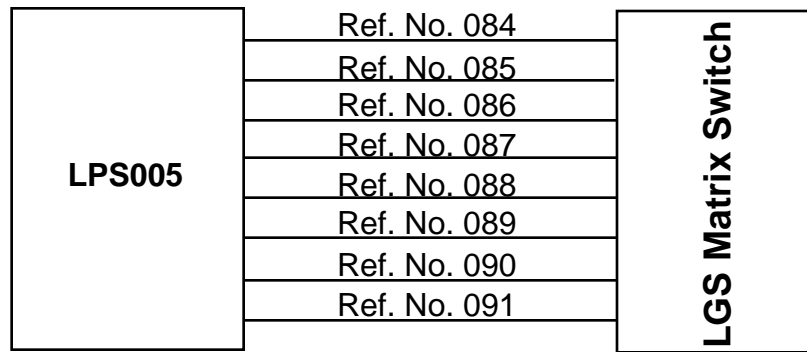
**LPS FDDI Network Interconnection Diagram**



IRISconsole and Other Systems Interconnection Diagram



LPS Systems and LGS Matrix Switch Interconnection Diagram



LPS Systems and LGS Matrix Switch Interconnection Diagram (Cont.)

Appendix D—LPS Host Name and IP Address

| System Name | Host Name | IP Address | |
|--------------------|-----------|------------------|----------------|
| | | Ethernet | FDDI |
| Challenge XL 1 | lps001 | 08:0:69:02:6B:A4 | 8:0:69:4:2B:69 |
| Challenge XL 2 | lps002 | 08:0:69:02:87:73 | 8:0:69:4:49:25 |
| Challenge XL 3 | lps003 | 08:0:69:02:87:AD | 8:0:69:4:48:A3 |
| Challenge XL 4 | lps004 | 08:0:69:02:87:57 | 8:0:69:4:48:F8 |
| Challenge XL 5 | lps005 | 08:0:69:02:81:B4 | 8:0:69:4:2C:C5 |
| Indy Workstation 1 | indy1 | 08:0:69:0A:EE:E9 | n/a |
| Indy Workstation 2 | indy2 | 08:0:69:0A:36:C8 | n/a |
| Indy Workstation 3 | indy3 | 08:0:69:0A:37:BB | n/a |
| X-Terminal 1 | lpsx001 | 0:0:A7:0:BE:81 | n/a |
| X-Terminal 2 | lpsx002 | 0:0:A7:0:BE:95 | n/a |
| HP LaserJet 1 | hp1 | 08:0:09:AA:D8:CE | n/a |
| HP LaserJet 2 | hp2 | 08:0:09:AA:18:38 | n/a |

Appendix E—Recommended Tools and Equipments

- Computer service tool kits
- Digital multimeter
- 400MHz Oscilloscope
- Transmission test set (BER test set with differential ECL interface min 75 Mbps)
- Personal computer (PC) with available serial port and the advance micro devices (AMD) MACHPRO software (for MACH 460 EPLD programming)
- Transmission test set cables

Appendix F—Preventative Maintenance Schedule

Preventative Maintenance Schedule

| System Name | Preventative Maintenance |
|-------------------------------------|--|
| SGI Challenge XL | Clean the 4mm DAT drive every 25 hours of use; Clean the 8mm tape drive's heads either one a month or after every 30 hours of use. |
| Indy Workstation | Not required |
| X-Terminal | Not required |
| IRISconsole | Not required |
| Ethernet 10Base-T SuperHub | Not required |
| Box Hill MDL1C-7-DLT4 Media Changer | The DLT drive embedded within Box Hill MDL1CL-7 has a self cleaning mechanism. The tape drive heads needs cleaning ONLY when the Use Cleaning Tape LED on the front panel of the media changer lights. The cleaning cartridge must be inserted into the tape drive using the front panel pushbutton keys. Note that, a cleaning cycle should ONLY be done when the LED lights on the front panel. Excessive use of cleaning tapes can cause the tape drive heads to wear out prematurely, thus causing unexpected hardware failures. |
| HP LaserJet 5 Printer | Clean the printer every time changing the toner cartridge, or whenever print quality problems occur |
| Epson LQ-570PLUS Printer | Clean the printer thoroughly several times a year |
| 6700 Disk Arrays, Model AR 6702 | Clean the air filter once every six months, or more frequently if the environment is dusty or the subsystem is in an exposed area. |

Appendix G—Ciprico 34 GB RAID disk partition & xfs file structure

Disk partition table:

```

----- partition -----
part  type              cyls              blocks              megabytes
                                (base+size)
0:   xfs                 2+2              36288+ 36288        18+18
1:   raw                 4+4              72576+ 72576        35+35
6:   xfs                 8+3690  145152+ 66951360  71+32691
7:   xfs                 2+3696  36288+ 57060224      18+32744
8:   volhdr              0+2              0 + 36288  0+18
10:  volume 0+3698        0 +67096512        0+32762

```

xfs file structure:

```

meta-data  =/dev/dsk/dksxxxd1s7      isize=256      agcount=32,
                                           agsize=261954 blks
data        =                          bsize=4096      blocks=8382528
log         =internal log             bsize=4096      blocks=1000
realtime =none                        bsize=65536      blocks=0,
                                           rtextents=0

```

Appendix H—Spare Parts List

| <u>SYSTEM</u> | <u>PART NAME</u> | <u>QTY</u> |
|--------------------|--------------------------------------|------------|
| – CHALLENGE XL | HPDI/VSIO | TBD |
| – CIPRICO (RAID) | 8+1 DISK CONTROLLER | 2 |
| – CIPRICO (RAID) | 4-GBYTE DRIVE | 3 |
| – CIPRICO (RAID) | POWER SUPPLY | 2 |
| – CIPRICO (RAID) | DISPLAY PANEL | 3 |
| – CIPRICO (RAID) | POWER SWITCH | 3 |
| – CIPRICO (RAID) | FAN | 3 |
| – CIPRICO (RAID) | FILTER | 3 |
| – CIPRICO (RAID) | OVER TEMP. SENSOR (45) | 3 |
| – CIPRICO (RAID) | OVER TEMP. SENSOR (50) | 3 |
| – BOX HILL MDL1C-7 | SCSI SE TO DIFF. SCSI CONVERTER | 1 |
| - LABEL PRINTER | EPSON LQ-570+ | 1 |
| - BOX HILL MDL1C-7 | MAGAZINE HOLDER (Part# SMAG-MDL1C-7) | 5 |
| - CIPRICO (RAID) | Paralan SCSI SE/DF Converter | 1 |

Appendix I—SCSI IDs List

| SYSTEM | Control by (System / SCSI controller No.) | Unit SCSI ID No. |
|---------------------------------|---|------------------|
| IRISconsole | Indy W/S # 3 SCSI Controller # 0 | 5 |
| Challenge XL-CD-ROM | Challenge XL SCSI Controller # 0 | 5 |
| Challenge XL-4mm DAT | Challenge XL SCSI Controller # 0 | 4 |
| Challenge XL-8mm TAPE | Challenge XL SCSI Controller # 0 | 6 |
| Challenge XL-4.3 GB system disk | Challenge XL SCSI Controller # 1 | 1 |
| Box Hill MDL1C-7 | Challenge XL SCSI Controller # 131 | 5 |
| Capture RAID | Challenge XL SCSI Controller # 133 | 2 |
| Transfer RAID | Challenge XL SCSI Controller # 134 | 4 |

Note: Each LPS string has an identical setup

Appendix J—LPS Cable Parts List

| Ref. No. | Description | Manufacture | Part No. |
|----------|-------------------------|-----------------|-------------|
| 001 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 002 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 003 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 004 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 005 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 006 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 007 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 008 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 009 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 010 | SCSI-P cable 25' | Ciprico Inc. | CA0036 |
| 011 | Single-Ended SCSI cable | BoxHill | 500268M-240 |
| 012 | Single-Ended SCSI cable | BoxHill | 500268M-240 |
| 013 | Single-Ended SCSI cable | BoxHill | 500268M-240 |
| 014 | Single-Ended SCSI cable | BoxHill | 500268M-240 |
| 015 | Single-Ended SCSI cable | BoxHill | 500268M-240 |
| 016 | differential SCSI cable | BoxHill | CABL-SC3 |
| 017 | differential SCSI cable | BoxHill | CABL-SC3 |
| 018 | differential SCSI cable | BoxHill | CABL-SC3 |
| 019 | differential SCSI cable | BoxHill | CABL-SC3 |
| 020 | differential SCSI cable | BoxHill | CABL-SC3 |
| 021 | 10 Base-T patch cable | (Supply by EDC) | |
| 022 | 10 Base-T patch cable | (Supply by EDC) | |
| 023 | 10 Base-T patch cable | (Supply by EDC) | |
| 024 | 10 Base-T patch cable | (Supply by EDC) | |
| 025 | 10 Base-T patch cable | (Supply by EDC) | |
| 026 | 10 Base-T patch cable | (Supply by EDC) | |
| 027 | 10 Base-T patch cable | (Supply by EDC) | |
| 028 | 10 Base-T patch cable | (Supply by EDC) | |
| 029 | 10 Base-T patch cable | (Supply by EDC) | |
| 030 | 10 Base-T patch cable | (Supply by EDC) | |
| 031 | 10 Base-T patch cable | (Supply by EDC) | |
| 032 | 10 Base-T patch cable | (Supply by EDC) | |
| 033 | AUI cable | (Supply by EDC) | |
| 034 | FDDI cable | Sgi | M502121-5 |
| 035 | FDDI cable | Sgi | M502121-5 |
| 036 | FDDI cable | Sgi | M502121-5 |
| 037 | FDDI cable | Sgi | M502121-5 |
| 038 | FDDI cable | Sgi | M502121-5 |
| 039 | FDDI cable | Sgi | M502121-5 |
| 040 | FDDI cable | Sgi | M502121-5 |
| 041 | SCSI cable | Sgi | 6200-018 |
| 042 | DB9 to DB25 cable | Sgi | XVIC25P |
| 043 | DB9 to DB25 cable | Sgi | XVIC25P |
| 044 | DB9 to DB25 cable | Sgi | XVIC25P |
| 045 | DB9 to DB25 cable | Sgi | XVIC25P |

| Ref. No. | Description | Manufacture | Part No. |
|----------|---------------------------------------|------------------------|-------------|
| 046 | DB9 to DB25 cable | SGI | XVIC25P |
| 047 | DB9 to DB25 cable | SGI | XVIC25P |
| 048 | DB9 to DB25 cable | SGI | XVIC25P |
| 049 | DB9 to DB25 cable | SGI | XVIC25P |
| 050 | DB9 to DB25 cable | SGI | XVIC25P |
| 051 | DB9 to DB25 cable | SGI | XVIC25P |
| 052 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 053 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 054 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 055 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 056 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 057 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 058 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 059 | 42' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-504 |
| 060 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 061 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 062 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 063 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 064 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 065 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 066 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 067 | 38' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-456 |
| 068 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 069 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 070 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 071 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 072 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 073 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 074 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 075 | 36' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-432 |
| 076 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 077 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 078 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 079 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 080 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 081 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 082 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 083 | 32' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-384 |
| 084 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 085 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 086 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 087 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 088 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 089 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 090 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 091 | 28' RG-58 cable w/male BNC connectors | Pasternack Enterprises | PE 3067-336 |
| 092 | Parallel printer cable (25') | Accupath | 97053523 |
| 093 | Parallel printer cable (25') | Accupath | 97053523 |
| 094 | Parallel printer cable (25') | Accupath | 97053523 |
| 095 | Parallel printer cable (25') | Accupath | 97053523 |
| 096 | Parallel printer cable (25') | Accupath | 97053523 |

Appendix K—LPS Software List

IRIS 6.2

ONC3 /NFS 6.2

IRIS Development Option 6.2 (including ProDev Workshop)

IRIX 6.2 Applications

IRIS Power C 6.2

Oracle Server 7.3.2

Oracle Dev 2000 1.3.1

LPS Software

Acronyms List

| | |
|--------|---|
| ac | alternating current |
| BIST | Built-in self test |
| BTU | British thermal unit |
| <CR> | Carriage return |
| CCB | Configuration Control Board |
| CD ROM | Compact disk read only memory |
| COTS | Commercial off the shelf |
| CPU | Central processing unit |
| DAAC | Distributed Active Archive Center |
| DAT | Digital audio tape |
| dc | direct current |
| DCN | Document Change Notice |
| DLT | Digital linear tape |
| DSP | Digital signal processor |
| ECL | Emitter-Coupled-Logic |
| EDC | EROS Data Center |
| EEPROM | Electrically erasable programmable read only Memory |
| EROS | Earth Resources Observation System |
| ETM+ | Enhanced Thematic Mapper Plus |
| F/W | Fast and wide |
| FDDI | Fiber distributed data interface |
| FIFO | First in first out |
| FTP | File Transfer Protocol |
| GB | Giga Bytes |
| GSFC | Goddard Space Flight Center |
| HDF | Hierarchical Data Format |
| HP | Hewlett Packard |
| HPDI | High speed parallel digital interface |
| IP | Internet Protocol |
| IPD | Information Processing Division |
| IO | Input/Output |
| LAN | Local Area Network |
| LED | Light Emitting Diode |
| LGS | Landsat 7 Ground Station |
| LOR | Level OR |

| | |
|--------|---|
| LPS | Landsat 7 Processing System |
| Mhz | Megahertz |
| MO&DSD | Mission Operations and Data Systems Directorate |
| NASA | National Aeronautics and Space Administration |
| NCSA | National Center for Super computing Applications |
| NRZ-L | Non-return to zero-level |
| O&M | Operations and Maintenance |
| POST | Power-on self test |
| RAID | Redundant Array of Independent Drives |
| RAM | Random access memory |
| S/N | Serial number |
| SE | Single-ended |
| SCSI | Small computer system interface |
| SGI | Silicon Graphics Incorporated |
| SRAM | Static random access memory |
| TTY | Teletype |
| VAC | Volts alternating current |
| VCAM | VMEbus Channel Adapter Module |
| VME | Versa Module European |
| VSIO | Very high speed serial interface |
| W | Watt |